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The RAINBOW

10 YEARS

THE COLOR COMPUTER MONTHLY MAGAZINE

February 1991 Vol. X No.7

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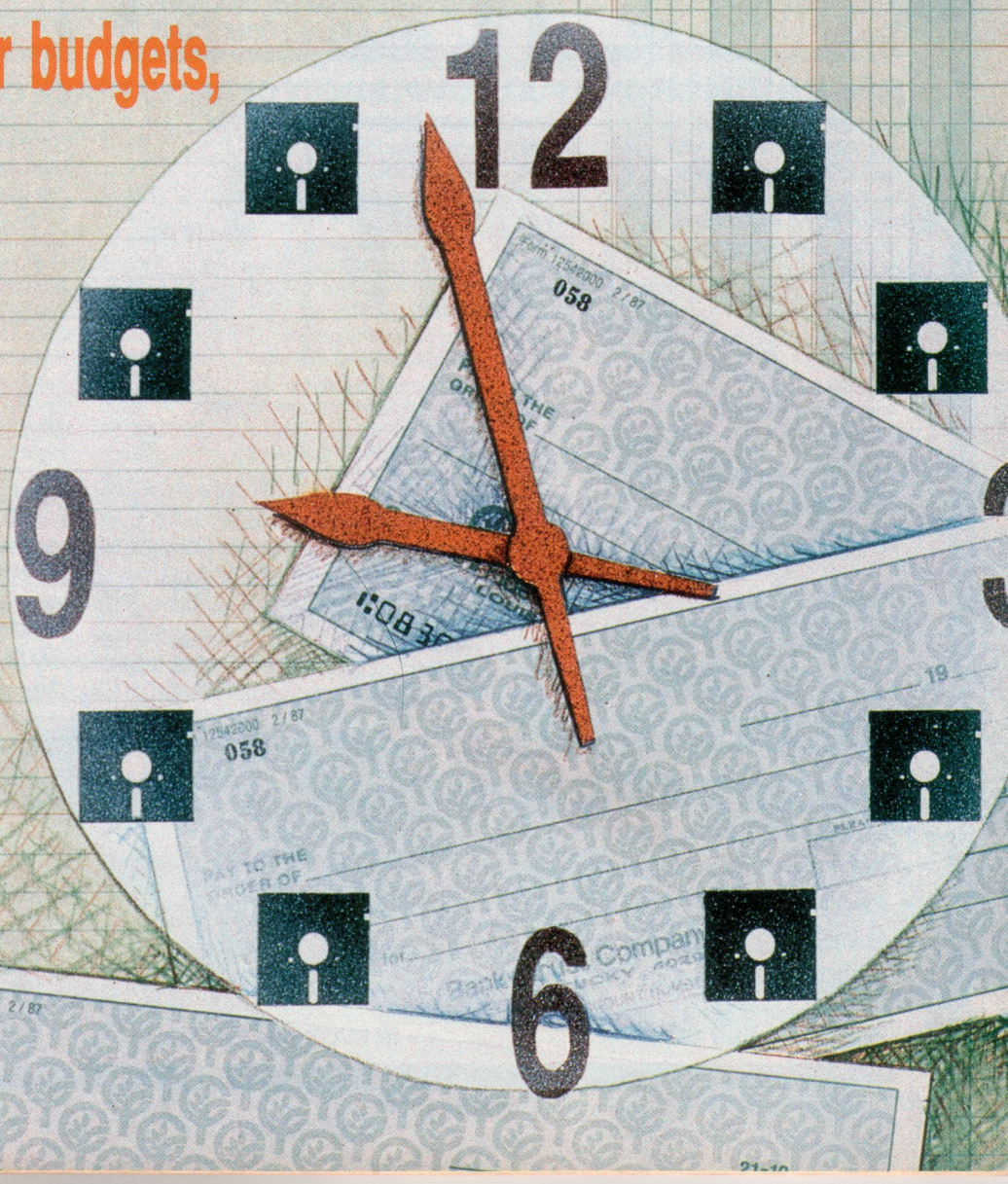

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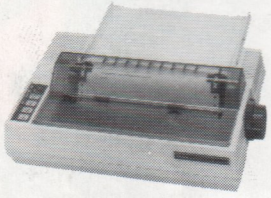

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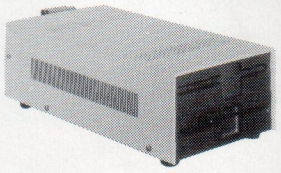

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10 YEARS

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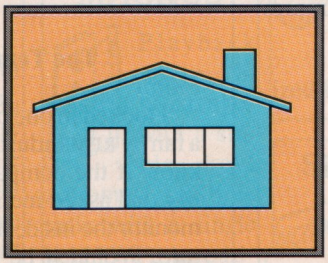

The cassette tape/disk symbols beside features and columns indicate that the program listings with those articles are on this month's RAINBOW ON TAPE and RAINBOW ON DISK. Those with only the disk symbol are not available on RAINBOW ON TAPE. For details, check the RAINBOW ON TAPE and RAINBOW ON DISK ad on page 77.

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Letters to the RAINBOW

Terminal Entries Response

Editor:

Although Jim Issel's "Terminal Entries" article was fairly thorough, I feel he neglected a few things. The most serious was his omission of *Ultimaterm*'s 45-number dialing directory, something I find indespensible in my telecommunications. All the parameters for each individual system can be set in the directory. It also has a redial feature that keeps calling a busy system until it gets through. The other thing I take issue with is that there *are* macros in *V-Term* as well as a 15-number dialing directory. In fact, I use these macros to access Delphi (username, password, etc.) when I'm using *V-Term*. You can also configure *V-Term* as a 128K or 512K terminal. In the 128K mode, you have full use of firmware RAM disks, such as those you would find on a 512K machine using Extended ADOS3. Finally, I think *AutoTerm* should have been included in the overview, since it is quite popular as well.

D. Steven Ricketts
Boring, Oregon

The Temperate Zone

Editor:

I looked in one of your issues and found a fan by REM Industries, Inc. I would like to know if the company is still in business. My dad asked me if there is a program to monitor the inside and the outside temperature. Would it be possible to send some information on this type of program and what hardware would be involved, besides my 64K CoCo 2 and disk drive?

Anthony Kiper
Route 1, Box 657
Grayson, KY 41143

See "Barden's Buffer" in the February 1990 issue, Page 42. Also, Tony Distefano started a project on temperature sensing in the January 1991 issue.

The Frustrating EOF

Editor:

I am becoming completely frustrated with the following program. I have only a beginner's knowledge of BASIC, acquired in 1984 when I bought my CoCo 1. Since then I have been on my own learning from THE RAINBOW. I started with a cassette system and have added a disk, which I am still learning to use. My system also includes a DMP-130. I bought a CoCo 3 recently, but I do not have the RGB monitor yet.

Going through back issues of THE RAINBOW to locate programs to (hopefully) run on my CoCo 3, I saw this little hint called *Data Finder*.

No matter where I put the EOF line (Line 60), the computer gives me an IE Error in Line 40. Please help me!

I had the same problem with XMASLIST (RAINBOW, December 1987, Page 66) when I changed it for disk operation as directed.

```
20 CLS:INPUT"WHAT IS THE NAME OF
 THE DATA FILE";DF$
30 OPEN"I",#1,DF$
40 INPUT#1,D$
50 PRINT#-2,D$
60 IF D$="EOF"OR D$=""THEN 80
70 GOTO 40
80 CLOSE#1
90 'PRINTS A DATA FILE WITHOUT T
HE PROGRAM IT BELONGED TO
100 'RBOW MAY 84 PG 81 HINT
110 'FIXED FOR PRINTER
```

Betty McCormick
P.O. Box 71243
Las Vegas, NV 89170

Not all data files meet the requirement of having an end-of-file string or a blank line. We suggest you replace Line 60 with

```
60 IF EOF(1) THEN 80
```

Also change INPUT *in Line 40 to* LINE INPUT *to allow* Data Finder *to read lines exactly as they are written.*

Getting to the Flip Side

Editor:

I have just purchased OS-9 Level II and would like to configure my system to use my double-sided disk drive. I used `config` and was successful in making a new system disk and formatting some disks. But how do I backup or copy this system disk to one of these newly formatted double-sided disks? According to my manual, the only command to do this is `dsave`. Is this correct? My problem is that I have only one disk drive. According to my manual, there is no parameter for single drive as there is with `copy` and `backup`. Can you help me?

I read the letters first when I get my new copy of THE RAINBOW and find them very informative. I could not find any letters that referred to my specific problem. I also reread several back issues about OS-9, but

...Just think of any word processing feature, chances are Word Power has it...packs a lot of features...excellent word processor..." **Word Proc. Comparison**-April 1989 Rainbow; Pg 26.

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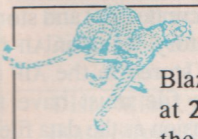

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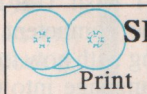

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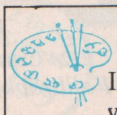

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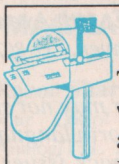
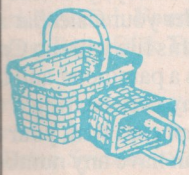


MAIL MERGE

Type a letter, follow it with a list of names & addresses and have Word Power print out personal-ized letters. Its that easy!



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Creates ASCII files that are compatible with other word-processors, terminal programs, etc. Allows directory point & select for easy loading/saving, **Automatic Backup**, file erase, free space display. **ARE YOU SURE?** prompts prevent accidental deletes. The **Auto-Save** feature automatically saves text to disk during user-defined intervals for peace of mind. Supports double-sided drives.

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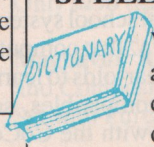

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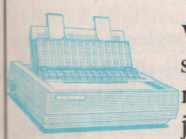

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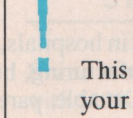
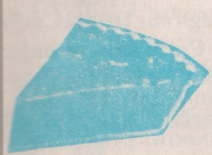


PUNCTUATION CHECKER

This checker will proofread your text for punctuation errors such as capitalization, dou-ble-words, a/an usage, spaces and more. Its the perfect addition to any word-proccessor.



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UPS 2ND DAY AIR

again couldn't find an answer. I do hope that, when Radio Shack discontinues the CoCo, you continue to publish THE RAINBOW. We CoCo users would be lost without it.

Mahalo and Aloha from Hawaii.

Martha A. Wryk
1650 Kanunu Street, #1311
Honolulu, HI 96814

We know of no easy way to copy a large number of files from disk to disk on a single-drive system. Perhaps one of our other readers can help.

Control at What Price?

Editor:

Please give me suggestions on how to proceed with the following project. I want to take a CoCo 3 and use it as a controller. My preference is to use BASIC and have the program reside in EPROM (and non-volatile RAM would be all right, too). My main goal is minimum hardware cost. (No disks, tape, etc.)

Also, is there a Forth-language kernel for the CoCo 3?

Gus Calabrese
4555 E. 16th Avenue
Denver, CO 80220

D.P. Johnson, who may or may not still be in business, marketed a Forth language for use under OS-9. Check back issues of THE RAINBOW for their ad.

In Excess

Editor:

A branch of our parochial school system recently received a grant of 12 IBM computers to be used by 5- and 6-year-olds to learn to read. Tandy sells IBM-compatibles, so why should they continue with the CoCo when these kids are going to demand more-profitable MS-DOS systems?

I love my CoCo. I know it can do whatever I tell it to. These children will never know!

There is a need for IBMs in hospitals, hi-tech businesses, and manufacturing, but I feel sorry for financially unable parents who must spend beyond their means to satisfy their children's superficial desires because the rich want to get richer.

My children are all married, but I would not like it for my grandchildren to look at my CoCo as something unworthy. (Better to *hide* it before they arrive!)

I like to compare computers with nuclear energy. Both can be used for good, if used only in necessary amounts. Autos are built to exceed 100 mph, but only the racetrack allows speeds in excess of 60 mph. So, the excess is potent, but not neccessary, making its cost excessive.

It's true, the best costs less, as long as it is best for your needs. Any excess increases the cost, making it not the best for you! Unnecessary benefits are a luxury that keeps many people fooled.

Vic Kells
Appleton, Wisconsin

ML09?

Editor:

I'm trying to gain some proficiency with OS-9/BASIC09 and in perusing back issues of this magazine I often see machine-language routines outlined. I wish THE RAINBOW would get someone competent to write some articles dealing with how to generate and get machine language into OS-9/BASIC09. I'd also like to see you cover how to use the *Development System*, whose manual totally ignores the question of how to use it, with representative examples.

Hope to get a positive response to this request!

F. Bruhns
2224 Canyon View
Fallbrook, CA 92028

Speaking of Hardware

Editor:

I didn't find in the November 1990 issue of THE RAINBOW the manual, of sorts, that explains how to use the Tony DiStefano's EPROM programmer and software (October 1990, Page 64).

In the same issue Marty Goodman is correct in suggesting the use of amber monochrome monitors. I prefer monochrome when using 80-column text. The use of the following CoCo 3 pokes are necessary to get a good monochrome picture on all screens:

```
POKE &HE033,16
POKE &HE03C,19
POKE &HE045,19
POKE &HE07A,144
POKE &HE071,144
```

Hang in there with hardware projects as well as the rest.

R. R. Simpson
Manhattan Beach, California

The "manual" appears in the December installment of "Turn of the Screw."

Breaking up Multi-Vue

Editor:

The *Multi-Vue* manual describes a procedure to bring up the control program as a stand-alone routine in a 16-color window, allowing users to set up the additional palettes unavailable under the regular four-color `gshell` window. It may be of interest to your readers to know this procedure can also be used to run the *Calendar* program in a similar way. The advantage to this is the data file created when the program is run can then be double-clicked to bring up the user's personal dates to remember.

To accomplish this, an icon for the *Calendar* program must be created (use *IconEdit* or *Maxic* to create this) and stored in the `ICONS` subdirectory. Next, an AIF file must be created and stored in the AIF (or root) directory. This file must have the same three letter extension as the data file(s) to be created. (I use `AIF.rem` as a reminder.) The following is my `AIF.rem` file:

```
Calendar {name of program}
{blank} {no parameters}
ICONS/icon.Calendar {path to icon}
0 {use default memory}
6 {select 320x192 4-color graphics window}
40 {screen width}
24 {screen length}
0 {background palette register}
1 {foreground palette register}
```

Do not type the comments in the brackets. These are for information only.

You are now ready to call up the *Calendar* program in the normal way, via the Tandy menu, and enter your personal data. When you are finished, save the file as `Personal.rem`, for example. When you return to the `gshell` window and update your current data directory, you will find the file `Personal` under your Calendar icon. Double-clicking on this file will run Calendar with `Personal` as a parameter and there you are! Note that any files bearing a `.rem` extension will be displayed with your Calendar icon, so you can have any number of data files.

Gerry Gerhart
Huntsville, Ontario
Canada

THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, type `RAI` to take you into the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, type `LET` to reach the LETTERS> prompt and then select Letters for Publication. Be sure to include your complete name and address.

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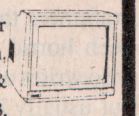

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Documented Evidence

The most alarming trend I detect in the whole computing area seems to me to be that which involves documentation. Documentation, of course, is the instructions needed to actually use a program.

Much like anything else, even in our world of the CoCo there are distinct stages in how documentation has developed. First of all, most of it was written by the programmers themselves. This has generally been horrid documentation since anyone who writes a program knows how it works, but usually has very little idea of how to explain it to anyone else. In addition, often such documentation is filled with technical details that make great sense to the programmer, but precious little to "normal" people.

Throughout the Color Computer's history, I believe quite a number of good programs have been ruined simply by their documentation. This really is a shame, but despite suggestions from customers to negative reviews on these pages, for some it remains the way things are.

The second stage of documentation development seems to have come about when program authors did indeed decide they were not conveying the message properly and hired professionals to write the instructions for them. While this made things a bit easier in the CoCo world, in other computer platforms I think most of these writers were paid by the word; this was (and is) some of the most comprehensive documentation ever seen — pages and pages and pages of it.

I once had friends who went into business as "professional documentation authors." Although they never got any *major* orders, they did get enough work and ended up writing a fairly simple word processor to help with their work. Unfortunately, they tried to market the word processor and used *its* documentation as an example of how they could thoroughly explain someone else's program.

It was thoroughly explained in three or four different ways. Fortunately, the program had only about a dozen functions and the documentation was "limited" to about 250 pages. You get the idea.

I am sure people like myself, who complain about massive amounts of data to digest, have prompted the third stage in documentation. I call this stage the 1-2-3 approach, with no intentional reference to the spreadsheet programs produced by Lotus. This stage simply tells you to perform Step 1, Step 2 and then Step 3 — no details; no information about why or what you can do to deviate from this approach. And worst of all, no way to correct anything that goes wrong (if, say, you hit the wrong key) without starting over again at Step 1. Interestingly, CoCo documentation generally has not followed this path. I hope it will not.

Microsoft seems to be the world's leader in 1-2-3 documentation. For example, they have even hard-bound their documentation for *Word for Windows*, but it is still pretty much all 1-2-3. This is fine if everything goes right while you are doing whatever it is you want to do, but more explanation really is necessary.

Through talking with a number of people in the business, I find the 1-2-3 approach produces the most user-friendly documentation. We're likely to see more of it in the future. I hope not — or at least I hope not until it is augumented by real explanations of how the particular program works. I say this from personal preference, but also because I think that no matter how basic the level of computer skill the user posesses, it helps the user understand what he is doing regardless.

I once hired a secretary primarily because her resume showed she had experience using the same word processor I used. I thought life would be easier if we did not have to convert formats back and forth. About two days after she came to work, she asked me how to do a search and replace. I told her something like "press the Search key, then type in the word you are looking for . . ."

She interrupted me and asked which keys I was talking about. I repeated, "the Search key."

"But what key is that?" she asked.

"F2."

"Oh, OK," she said.

We then went through the keystroke sequences and she wrote it all down. A week or two later, she returned with the same question. I told her I thought she knew how to use this particular word processor. She replied that she *did*.

"Well, then, why don't you know that F2 is the Search key?" I asked.

She replied, "Oh, I don't know what the keys are for. I just press them."

I pointed out to her, and I'll point out to you and to all the members of the 1-2-3 school of documentation, she didn't know a thing about the *program*. She would spend countless hours looking up the right keys rather than just learning what they do.

If the documentation that comes with a program frustrates you, let the software publisher know about it. I think it will make for better documentation in the future.

— Lonnie Falk

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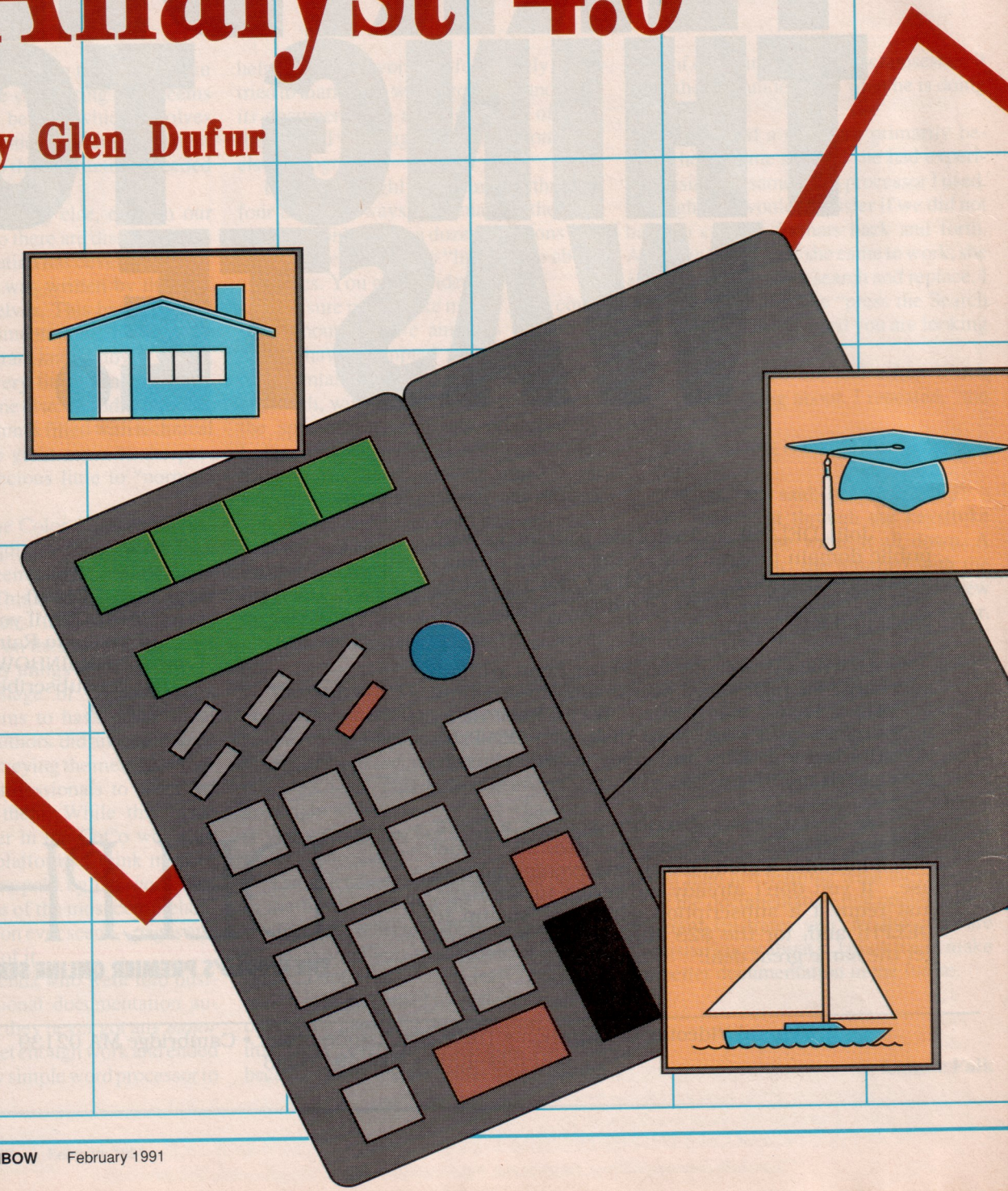
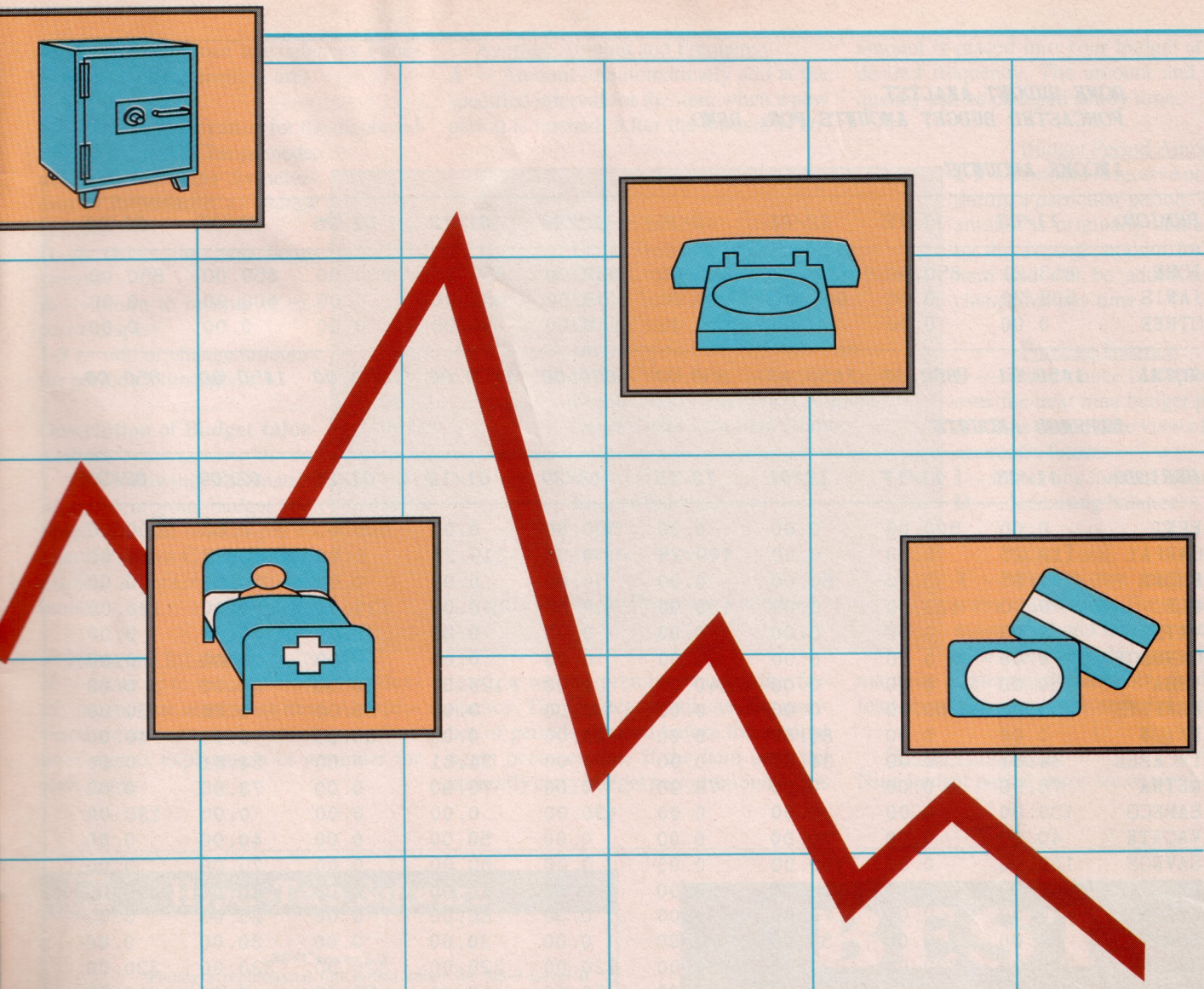
Home Budget Analyst 4.0

by Glen Dufur





Can't save any money? Is it sometimes difficult to make ends meet? Do you wonder where your money goes? Do you forget about upcoming bills? Perhaps you need a bookkeeper to help balance your budget. Meet *Home Budget Analyst*.

Home Budget Analyst is a program to record and maintain your personal budget, estimate income and expenses for future budgeting periods, view future account balances, provide a record of income and payments and forecast financial necessities and opportunities.

Features of this program include a scrollable (up/down, left/right) data display, easy to use single-key option menus, disk storage and recovery of budget information as well as various printed views of budget information.

Home Budget Analyst calculates and forecasts your next nine budgeting periods (or paydays) to allow scheduling and balancing of payments over future periods. *Home Budget Analyst* retains and maintains period income and expenses, forecasted balances and year-to-date totals for each item entered. You can make the forecasted balance either increasing or decreasing to see remaining amounts on loans and credit card balances as well as increasing amounts in savings or other accounts. Three printed reports provide a record of income and expense history.

Home Budget Analyst is easy to use. A menu of options is displayed on each screen to assist your movement through the budgeting functions. In most cases, a single key performs the functions of this program.

The original version of *Home Budget Analyst* was published in THE RAINBOW in March 1986. Since then I have made many improvements in its operation, function and appearance. It has become an extremely useful tool for maintaining a personal budget.

Starting Your Personal Budget

To start the program enter `RUN "BUDGET"`. Enter your password (any string up to five characters, use your name or the budget year) to identify your budget file. Begin your budget entry by selecting C to create a new budget file. If your file already exists, select L to load.

When opening a new budget file enter the dates of nine future "periods," or paydays, from which to establish your payment dates. Start the first period with your next payday. You are prompted for

Glen Dufur works for Airborne Express as a development manager for data processing systems. He can be contacted at 12409 156th Avenue S.E., Renton, WA 98059. Please include an SASE when requesting a reply.

HOME BUDGET ANALYST
FORCASTED BUDGET AMOUNTS FOR: DEMO

INCOME AMOUNTS

PERIOD>	11/03	11/17	12/01	12/15	12/29	01/12	01/26	02/09	02/23
JOHN	853.21	850.00	850.00	850.00	850.00	850.00	850.00	850.00	850.00
JANIS	603.70	0.00	600.00	0.00	0.00	600.00	0.00	600.00	0.00
OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	1456.91	850.00	1450.00	850.00	850.00	1450.00	850.00	1450.00	850.00

EXPENSE AMOUNTS

PERIOD>	11/03	11/17	12/01	12/15	12/29	01/12	01/26	02/09	02/23
RENT	0.00	500.00	0.00	0.00	500.00	0.00	500.00	0.00	500.00
CARPAY	119.25	0.00	0.00	119.25	0.00	119.25	0.00	119.25	0.00
PHONE	47.35	0.00	50.00	0.00	50.00	0.00	0.00	50.00	0.00
ELEC	0.00	120.00	0.00	120.00	0.00	0.00	120.00	0.00	120.00
WATER	0.00	0.00	0.00	0.00	0.00	0.00	35.00	0.00	0.00
GARBAGE	0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00
VISA	50.00	0.00	0.00	140.00	0.00	120.00	0.00	80.00	0.00
PENNEYS	0.00	60.00	0.00	0.00	30.00	0.00	50.00	0.00	50.00
EXXON	0.00	0.00	80.00	0.00	80.00	0.00	80.00	0.00	80.00
TVCABLE	34.81	0.00	34.81	0.00	0.00	34.81	0.00	34.81	0.00
AETNA	78.90	0.00	0.00	78.90	0.00	78.90	0.00	78.90	0.00
SAFECO	130.00	0.00	0.00	0.00	130.00	0.00	0.00	0.00	130.00
VACATN	40.00	0.00	70.00	0.00	0.00	50.00	0.00	40.00	0.00
SAVNGS	100.00	0.00	120.00	0.00	0.00	60.00	0.00	70.00	0.00
XMAS	40.00	0.00	100.00	0.00	0.00	40.00	0.00	40.00	0.00
EMRGNY	40.00	0.00	70.00	0.00	0.00	80.00	0.00	25.00	0.00
BOAT	30.00	0.00	30.00	0.00	0.00	30.00	0.00	30.00	0.00
HSEHLD	320.00	320.00	320.00	320.00	320.00	320.00	320.00	320.00	320.00
DDS	60.00	0.00	60.00	0.00	50.00	0.00	58.00	0.00	10.00
DR	50.00	0.00	50.00	0.00	50.00	0.00	50.00	0.00	50.00
IRA	0.00	152.00	0.00	152.00	0.00	152.00	0.00	152.00	0.00
TOTAL	1140.31	1152.00	984.81	955.15	1210.00	1084.96	1213.00	1039.96	1260.00

BUDGET PERIOD BALANCE

PERIOD>	11/03	11/17	12/01	12/15	12/29	01/12	01/26	02/09	02/23
BALANCE	316.60	-302.00	465.19	-105.15	-360.00	365.04	-363.00	410.04	-410.00

Figure 1: Sample Table of Amounts

the month and day of the period in each new file. You can now enter your budget items.

Income and Expense Displays

Income and Expense displays are identical in operation. They provide a view of the file with a scrollable up-down motion for a list of items in the file, or a left-right motion to span over budget periods. Up to 45 expense items and 15 income sources are available, each with nine budgeting periods. An "available" balance of committed funds is calculated for each budget period to allow for proper adjustments during times of cash shortage.

Functions from the Income and Expense display are:

Arrow Keys — move up or down the list of items and left or right through the budgeting periods. Hold the SHIFT key with the arrow to bring the list to the top or bottom, or the budgeting period to the extreme left or right.

A-I — select the item to view or maintain by pressing the corresponding letter.

N — add a new item to the budget list.

P — use budget-printing functions.

O — open a new budgeting period; the current period (1) will be rolled off.

X — exit to opposite display (expense to income or vice versa)

S — save the budget information on disk.

M — see menu of the budgeting options.

Income and Expense Item Display

This display contains unique information for each item, such as description, amount for all periods, average and fre-

quency of occurrence, and balances. Functions of the Item displays are:

C — change information for the displayed item. When in the Change mode, an additional menu for selection of information to change appears.
D — delete the item being viewed.
R — return to income or expense display.
1-9 — add or change amounts for periods 1 through 9.

Description of Budget Information

The following information is stored in your budget file. Much of it can be changed by selecting Option C from the Item display to enter the change mode.

Name and Information

N — Enter up to seven characters to identify the income or expense item. Also provided are up to 19 characters of space for a brief memo, explanation or reminder for each item.

Average Amount and Frequency

A — Amount to automatically add at the specified interval for the item when a new period is opened. After the amount is entered, a second prompt requests the frequency. The frequency indicates the number of periods skipped before the amount again becomes due. If the item does not currently carry budget period amounts, this amount is placed into your budget at the desired frequency. The amount and frequency can be changed at any time.

DR$(x) / CR$(x)	Debit/Credit Item Name
DA(x) / CA(x)	Debit/Credit Item Average Amt
DF(x) / CF(x)	Debit/Credit Item Ave Amt Frequency
DY(x) / CY(x)	Debit/Credit Item YTD Balance
DT(x) / CT(x)	Debit/Credit Totals
DB$(x) / CB$(x)	Debit/Credit Item Balance Type
DB(x,y) / CB(x,y)	Debit/Credit Item Balance Amount
DR(x,y) / CR(x,y)	Debit/Credit Item Period Amount
DL / CL	Debit/Credit Last Item Number
PD$(x)	Period Date
BL(x)	Budget Balance

x = item, y = period

Figure 2: Major Program Variables

Budget Period Amount

1-9 — Amount to receive or pay during a particular period. This amount is originally defaulted by the average amount for the item and can be added to or changed at any time.

Forecast Balance

B — This balance is displayed over the next nine budget periods for a cumulative view of the account's future.
I — increasing forecast balance.
D — decreasing balance.

YTD Total

Y — Year-to-date total is always ascending. The total is maintained and increased each time a new period is opened. To maintain proper yearly amounts, the YTD total should be zero at the end of the year.

Budget Period Date

Nine budget period dates are entered dur-

Hyper-Tech Software

MVCanvas 2.0

Finally a professional full screen editor for OS-9 Level II and Multi-Vue. MVCanvas is the only CoCo graphics editor to support multiple resolutions with up to 16 colors of 64 displayed in 320 x 200 mode with palette animation and full functional clipboard.

MVCanvas also supports multiple fonts with inverse, bold underline, and proportional options. Printer support includes: Epson, Star, C.Itoh, DMP (Tandy), with color printer supported for Star NX-1000 R, Citizen GSX-140, Tandy DMP-240 amd CGP-200, Epson LQ-2550 and compatables.

ShellMate 2.2

ShellMate is the epitome of what a point and click file management system was meant to be. With ShellMate, you have access to commands such as copy, move, delete, rename, makdir and free at the touch of a button. It also gives you point and click access to the Public Domain picture display utilities VEFShow and GIFOS9, as well as the archive utility Ar.

The biggest benefit of ShellMate is that it allows you to manipulate large batches of files with one mouse click when either copying, moving, deleting or arcing. You can also easily move through simultaneously displayed Source and Destination directory trees by either double clicking on a subdirectory name, or clicking on the "Parent" command.

System Requirements (both programs)
CoCo3, OS-9 LVL II, Multi-Vue, Disk Drive and 512k
MVCanvas $49.95
ShellMate $24.95
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ing the creation of a new file. Also, each time a new period is opened (Option O from any display), an additional period date is entered. The period date is stored in mm/dd format.

Schedule your personal budget dates by paydays. Schedule all your bills to specific paydays. If you have a two-income household with different pay dates, an alternative is to hold one of the income sources so it coincides with each budget period.

Available Balance

Amount of funds uncommitted, or overcommitted if account is negative, during a particular budget period. The calculated balance is a sum of all income less expenses for each period. The available balance appears on income and expense displays for each of the nine budget periods.

Opening a New Budget Period

After bills for the current period have been paid, open a new future period. Select Option O to open a new period, and enter the new ninth period date. The function drops the first period, moves the Period 2 amount to Period 1, and so on until the ninth period is empty. Ninth-period amounts are defaulted based on the average amount and frequency. That is, the entries in all previous records are averaged in both value and frequency. These values are then entered into the ninth period for you. For example, if you entered a car payment of $250 in periods 2, 4, 6 and 8, this is entered in Period 9 after the program moves periods 2, 4, 6 and 8 to periods 1, 3, 5 and 7. All balances are automatically updated. Remember to make any necessary adjustments to this value.

Printed Reports

Several printed reports are available to view your budget information. Option P offers the following reports.

Current Payments

P — This report prints a summary of items in the first period of your budget. Only those items with amounts during the period are printed. The report can be used as a guide for paying bills. It is also an excellent record of payments and income.

Table of Amounts

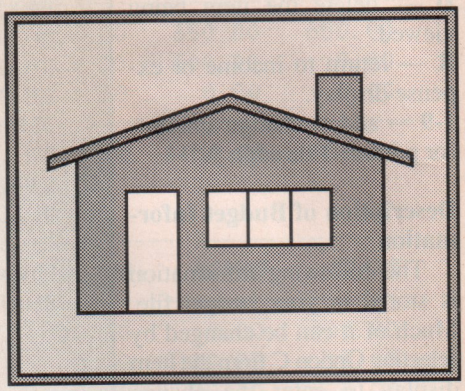
A — This report gives you a hard-copy representation of your entire budget. Each income and expense item is listed with the amount allocated for the nine budget periods as shown in Figure 1.

Table of Balances

B — This report lists forecasted balances for all items for each period.

Saving Budget Information

It is important to save your budget file after each session of updating. This saves the changes and makes them available for your next session. The program does not automatically save your budget file. Your budget file is saved with the name B*XXXXX*.BUD where *XXXXX* is your five-character password.



Technical Information

Figure 2 shows the major program variables used by *Home Budget Analyst.*

The program is written to support a DMP-130 printer. Adjustments can be made to support other printers. Please refer to the following information for printer baud and codes.

Printer Baud Rate

Change POKE 150,18 in Line 2770 for a different baud rate:

POKE 150,*XX* (*XX* = your baud selection)

Baud	Value
600	87
1200	40
2400	18
4800	7
9600	1

Printer Control Codes

The values for Q0$ through Q4$ in Line 2770 represent the following printer control codes. Change the values to the codes needed for your printer.

String Variable	Control Code
Q0$	Compressed (12 cpi)
Q1$	Italic start
Q2$	Italic end
Q3$	Bold start
Q4$	Bold end

Speed-Up Poke

To disable the operation of this feature, change lines 120 and 130 to RETURN. If using this poke, the program automatically puts things back to normal for all I/O routines.❑

32K Disk

100 181	1330 233	2690 57
200 56	1440 215	2770 79
260 23	1530 92	2820 73
340 22	1610 80	2860 237
410 181	1690 107	2910 159
500 108	1770 241	2960 240
570 42	1860 13	3030 232
640 3	1970 243	3090 195
690 192	2080 113	3140 74
740 76	2170 146	3210 12
780 101	2260 255	3270 0
850 49	2300 185	3350 93
900 32	2340 72	3440 55
970 122	2400 48	3530 43
1060 159	2450 251	3590 233
1140 55	2530 220	END 129
1220 34	2620 236	

The Listing: BUDGET

```
10 'HOME BUDGET ANALYSIS
15 'WRITTEN BY GLEN DUFUR
20 'COPYRIGHT FEBRUARY 1991
25 'BY FALSOFT, INC.
30 'RAINBOW MAGAZINE
40 CLS:PRINT" WAIT...":GOTO3690
50 '--- SURE CURSOR
60 GOSUB160:PRINT@466,"y/n":
70 POKE(1024+466),32:POKE(1024+4
68),32:K$=INKEY$:POKE(1024+466),
25:POKE(1024+468),14
80 IFK$="" THEN70 ELSERETURN
90 '--- SELECT CURSOR
100 PRINT@448,STRING$(6,CHR$(128
));:K$=INKEY$:PRINT@448,"select"
;:IFK$="" THEN100 ELSEK=VAL(K$):
```

```
RETURN
110 '--- SPEED POKES
120 GOSUB150:POKE65495,0:GOSUB15
0:RETURN
130 GOSUB150:POKE65494,0:GOSUB15
0:RETURN
140 '--- SOUNDS
150 FORSS=1TO2:SOUND220,1:NEXTSS
:RETURN
160 FORSS=1TO9:SOUND220,1:NEXTSS
:RETURN
170 '--- BLANKING
180 PRINT@448,STRING$(63," ");:R
ETURN
190 '--- CALCULATE
200 IFH$<>"Y" THENRETURN ELSEH$=
"":GOSUB150:GOSUB180:PRINT@459,"
calculating";
210 LB=0:FORX=1TO NE:DT(X)=0:CT(
X)=0
220 FORY=1TO DL:DT(X)=DT(X)+DR(Y
,X):NEXTY:FORY=1TO CL:CT(X)=CT(X
)+CR(Y,X):NEXTY:BL(X)=CT(X)-DT(X
):LB=LB+BL(X):NEXTX:RETURN
230 '--- LIST TOTALS
240 PP=384:FORX=I(0)TO I(0)+2:PP
=PP+8:PRINT@PP,USING N8$;BL(X);:
NEXTX:RETURN
250 '--- LIST DATES
260 P1=I(0)+48:P2=I(0)+1+48:P3=I
(0)+2+48:POKE(1024+13),P1:POKE(1
024+21),P2:POKE(1024+29),P3:PRIN
T@41,USINGA5$;PD$(I(0));:PRINT@4
9,USINGA5$;PD$(I(0)+1);:PRINT@57
,USINGA5$;PD$(I(0)+2);:RETURN
270 '--- GET ITEM DATA
280 GOSUB150:GOSUB180:PRINT@449,
"      nAME bAL iNCREASE/dECLINE
CHANGE aVG-AMT  yTD-TOT  rETURN"
;:GOSUB100
290 IFK$="I" THENGOSUB570:GOTO28
0
300 IFK$="D" THENGOSUB570:GOTO28
0
310 IFK$="N" THENGOSUB370:GOTO28
0
320 IFK$="A" THENGOSUB410:GOTO28
0
330 IFK$="B" THENGOSUB490:GOTO28
0
340 IFK$="Y" THENGOSUB460:GOTO28
0
350 IFK>0 AND K<NE+1 THENRETURN
360 IFK$="R" THENRETURN ELSE280
370 GOSUB180:PRINT@449,"DESC: ";
:GOSUB150:LINEINPUT"";XD$:GOSUB1
80:PRINT@449,"INFO: ";:GOSUB150:
LINEINPUT"";XI$:IFXD$="" THENIFI
E$="e" THENXD$=DR$(I) ELSEXD$=CR
$(I)
380 XD$=XD$+S5$+S5$:XX$="":XX$=L
EFT$(XD$,7)+" "+LEFT$(XI$,19):XD
$=XX$:PRINT@02,STRING$(28," ");
390 IFIE$="e" THENDR$(I)=XD$:GOS
UB600: ELSECR$(I)=XD$:GOSUB640
400 RETURN
410 GOSUB180:PRINT@449,"AVG AMOU
NT";:GOSUB150:INPUTXA:IFXA=0 THE
NXF=1:GOTO430
420 GOSUB180:PRINT@449,"FREQ(1-9
)";:GOSUB150:INPUTXF
430 IFXF>9 THEN420 ELSEIFXF<1 TH
ENXF=1
440 IFIE$="e" THENDA(I)=XA:DF(I)
=XF:GOSUB530: ELSECA(I)=XA:CF(I)
=XF:GOSUB550
450 RETURN
460 GOSUB180:PRINT@449,"YTD BAL"
;:GOSUB150:INPUTXY
470 IFIE$="e" THENDY(I)=XY ELSEC
Y(I)=XY
480 PRINT@65,USINGN9$;XY;:RETURN
490 GOSUB180:PRINT@449," BEGIN B
AL";:GOSUB150:INPUTXB
500 IFIE$="e" THEN520DB(I,0)=XB:
XT=0:GOSUB600 ELSECB(I,0)=XB:XT=
0:GOSUB640
510 RETURN
520 DB(I,0)=XB:XT=0:GOSUB600:RET
URN
530 XX=0:FORX=1TO NE:XX=XX+DR(I,
X):NEXTX:IFXX>0 THENGOSUB600:RET
URN
540 FORX=1TO NE STEPDF(I):DR(I,X
)=DA(I):NEXTX:H$="Y":GOSUB600:RE
TURN
550 XX=0:FORX=1TO NE:XX=XX+CR(I,
X):NEXTX:IFXX>0 THENGOSUB640:RET
URN
560 FORX=1TO NE STEPCF(I):CR(I,X
)=CA(I):NEXTX:H$="Y":GOSUB640:RE
TURN
570 GOSUB150:IFIE$="e" THENDB$(I
)=K$:GOSUB890:GOSUB600: ELSECB$(
I)=K$:GOSUB890:GOSUB640
580 RETURN
590 '--- LIST DR AMT/BAL
600 PRINT@02,DR$(I);:PRINT@65,US
INGN9$;DY(I);:PRINT@75,USINGN7$;
DA(I);:POKE1024+51,(DF(I)+48):PR
INT@85,USINGN9$;DB(I,0);
610 PP=128:FORX=1TO NE:IFDB$(I)=
"I" THENDB(I,X)=DB(I,X-1)+DR(I,X
) ELSEDB(I,X)=DB(I,X-1)-DR(I,X)
620 PRINT@PP+1,USINGN1$;X;:PRINT
@PP+2,">";:PRINT@PP+4,USINGA5$;P
D$(X);:PRINT@PP+11,USINGN8$;DR(I
,X);:PRINT@PP+21,USINGN9$;DB(I,X
);:PP=PP+32:NEXTX:RETURN
630 '--- LIST CR AMT/BAL
640 PRINT@02,CR$(I);:PRINT@65,US
INGN9$;CY(I);:PRINT@75,USINGN7$;
CA(I);:POKE1024+51,(CF(I)+48):PR
INT@85,USINGN9$;CB(I,0);
650 PP=128:FORX=1TO NE:IFCB$(I)=
"I" THENCB(I,X)=CB(I,X-1)+CR(I,X
) ELSE CB(I,X)=CB(I,X-1)-CR(I,X)
660 PRINT@PP+1,USINGN1$;X;:PRINT
@PP+2,">";:PRINT@PP+4,USINGA5$;P
D$(X);:PRINT@PP+11,USINGN8$;CR(I
,X);:PRINT@PP+21,USINGN9$;CB(I,X
);:PP=PP+32:NEXTX:RETURN
670 '--- DELETE DR ITEM
680 GOSUB180:PRINT@460,"SURE?";:
GOSUB60:IFK$<>"Y" THENK$="":GOTO
1450
690 GOSUB180:PRINT@457,"deletein
g item";:DR$(I)="":DB$(I)="":DB(
I,0)=0:DA(I)=0:DY(I)=0:DF(I)=0:D
L=DL-1
700 FORZ=1TO NE:DR(I,Z)=0:NEXTZ:
FORX=I TO DL:IFDR$(X+1)="" THEN7
20
710 DR$(X)=DR$(X+1):DR$(X+1)="":
DA(X)=DA(X+1):DA(X+1)=0:DY(X)=DY
(X+1):DY(X+1)=0:DF(X)=DF(X+1):DF
(X+1)=0:DB$(X)=DB$(X+1):DB$(X+1)
="":DB(X,0)=DB(X+1,0):DB(X+1,0)=
0:FORZ=1TO NE:DR(X,Z)=DR(X+1,Z):
DR(X+1,Z)=0:NEXTZ
720 NEXTX:H$="Y":GOSUB200:GOTO10
50
730 '--- DELETE CR ITEM
740 GOSUB180:PRINT@460,"SURE?";:
GOSUB60:IFK$<>"Y" THENK$="":GOTO
2080
750 GOSUB180:PRINT@457,"deletein
g item";:CR$(I)="":CB$(I)="":CB(
I,0)=0:CA(I)=0:CY(I)=0:CF(I)=0:C
L=CL-1
760 FORZ=1TO NE:CR(I,Z)=0:NEXTZ:
FORX=I TO CL:IFCR$(X+1)="" THEN7
80
770 CR$(X)=CR$(X+1):CR$(X+1)="":
CA(X)=CA(X+1):CA(X+1)=0:CY(X)=CA
(X+1):CA(X+1)=0:CF(X)=CF(X+1):CF
(X+1)=0:CB$(X)=CB$(X+1):CB$(X+1)
="":CB(X,0)=CB(X+1,0):CB(X+1,0)=
0:FORZ=1TO NE:CR(X,Z)=CR(X+1,Z):
CR(X+1,Z)=0:NEXTZ
780 NEXTX:H$="Y":GOSUB200:GOTO16
60
790 '--- GET ITEM AMOUNT
800 GOSUB180:PRINT@449,"PERIOD"K
"AMOUNT";:GOSUB150:INPUTXX:IFIE$
="e" THENDR(I,K)=XX ELSECR(I,K)=
XX
810 H$="Y":RETURN
820 '--- INIT DISPLAY SCREEN
830 CLS:IFIE$="e" THENX1$=CHR$(2
52):X2$=CHR$(243):XX$="expense"
ELSEX1$=CHR$(204):X2$=CHR$(195):
XX$="income"+BB$
840 PRINT@0,STRING$(32,BB$);:PRI
NT@352,STRING$(32,X1$);:PRINT@41
6,STRING$(32,X2$);
850 PRINT@0,XX$;:PRINT@7," ";:PR
INT@15," ";:PRINT@23," ";:PRINT@
31," ";:PRINT@09,"per";:PRINT@17
,"per";:PRINT@25,"per";
860 PRINT@40,CHR$(133);:PRINT@46
,CHR$(138);:PRINT@48,CHR$(133);:
PRINT@54,CHR$(138);:PRINT@56,CHR
$(133);:PRINT@62,CHR$(138);
870 PRINT@32,"display";:PRINT@38
4,BB$;"avlbl";BB$;:PRINT@449,"
    arrws a-i nEW sAVE oPN x  mE
NU  SCRLL SEL ITM pRNT PER ^";:P
OKE(1024+462),45:RETURN
880 '--- INIT ITEM SCREEN
890 CLS:XX$=STRING$(8,BB$):PRINT
@1,CHR$(141);:PRINT@30,CHR$(142)
;:PRINT@33,XX$;:PRINT@41,CHR$(13
1);:PRINT@34,"ytd";:PRINT@38,"to
t";
900 PRINT@52,CHR$(130);:PRINT@53
,STRING$(10,BB$);:PRINT@116,CHR$
(138);:PRINT@117,STRING$(10,BB$)
;
910 PRINT@42,STRING$(10,BB$);:PR
INT@106,STRING$(10,BB$);:PRINT@9
7,STRING$(8,BB$);
920 PRINT@98,"period";:PRINT@108
,"amount";:PRINT@118,"balance";:
PRINT@42,"avg";:PRINT@46,"evry";
:IFIE$="e" THEN940
930 IFCB$(I)="I" THEN950 ELSE960
940 IFDB$(I)="I" THEN950 ELSE960
950 PRINT@53,"increasing";:GOTO9
70
960 PRINT@53,"declining";
970 PRINT@416,STRING$(32,X2$);:P
RINT@448,"                cHANGE n
EW ITEM   ACTION    PER dELETE r
ETURN";
980 POKE(1024+459),45:POKE(1024+
458),49:POKE(1024+460),57:RETURN
990 '--- FILE FULL
1000 GOSUB180:PRINT@458,"file fu
ll";:SOUND1,7:RETURN
1010 '--- SCROLL DR MONEY
```

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```
1020 FORY=I(0) TO (I(0)+2):IFDR(
X,Y)<>0 THENPRINT@PX,USING N8$;D
R(X,Y);
1030 PX=PX+8:NEXTY:RETURN
1040 '--- DEBIT DISPLAY
1050 IE$="e":GOSUB830:GOSUB260:G
OSUB240
1060 IFDL=0 THENPRINT@163,"enter
"BB$;"expense"BB$"items";:PRINT@
229,"hit"BB$"n"BB$"to"BB$"begin"
;:GOTO1110
1070 PP=64:PX=PP:IX=1:FORX=I(1)
TO I(1)+(SE-1):PRINT@PP+0,STRING
$(32,CHR$(143));
1080 IFX<(EN+1) THEN1090 ELSE110
0
1090 PX=PP:PRINT@PP+0,IX$(IX);:P
X=PX+1:PRINT@PX,USINGA6$;DR$(X);
:PX=PX+7:GOSUB1020
1100 I(IX)=X:IX=IX+1:PP=PP+32:NE
XTX:SOUND200,1
1110 I=0:GOSUB100
1120 IFK$=CHR$(09) THENIFI(0)=NE
-2 THEN1430 ELSE1380
1130 IFK$=CHR$(08) THENIFI(0)=1
THEN1430 ELSE1390
1140 IFK$=CHR$(21) THENIFI(0)=1
THEN1430 ELSEI(0)=1:GOTO1400
1150 IFK$=CHR$(93) THENIFI(0)=NE
-2 THEN1430 ELSEI(0)=NE-2:GOTO14
00
1160 IFK$=CHR$(95) THENIFI(1)=1
THEN1430 ELSEI(1)=1:GOTO1070
1170 IFK$=CHR$(91) THENIFI(1)+(S
E-1)=DL THEN1430 ELSEIFDL<=(SE-1
) THEN1430 ELSEI(1)=DL:GOTO1330
1180 IFK$=CHR$(10) THENIFI(1)+(S
E-1)=DL THEN1430 ELSEIFDL<=SE TH
EN1430 ELSE1320
1190 IFK$=CHR$(94) THENIFI(1)=1T
HEN1430 ELSE1350
1200 IFK$="M" THEN3290
1210 IFK$="N" THEN1590
1220 IFK$="X" THENI(1)=1:GOTO166
0
1230 IFDL=0 THEN1300
1240 IFK$="S" THENIO=2:GOSUB2480
:GOSUB200:GOTO1050
1250 IFK$="O" THENGOSUB2260:I(1)
=1:GOTO1050
1260 IFK$="P" THENGOSUB2710:I(1)
=1:GOTO1050
1270 FORX=1TO SE:IFK$=I$(X) THEN
I=I(X)
1280 NEXTX:IFI=0 THEN1300 ELSEIF
I>EN THEN1300
1290 IFDR$(I)<>"" THEN1450
1300 SOUND1,1:GOTO1110
1310 '--- SCROLL DR UP&DOWN
1320 I(1)=I(1)+(SE-1)
1330 IF(I(1)+(SE-1))>DL THENI(1)
=DL-(SE-1):IFI(1)<1 THENI(1)=1
1340 GOTO1070
1350 I(1)=I(1)-(SE-1):IFI(1)<1 T
HENI(1)=1
1360 GOTO1070
1370 '--- SCROLL DR SIDEWAYS
1380 I(0)=I(0)+1:GOTO1400
1390 I(0)=I(0)-1:IFI(0)<1 THENI(
0)=1
1400 GOSUB260:GOSUB240:PP=72:FOR
X=I(1)TO (I(1)+(SE-1)):PRINT@PP,
STRING$(23,CHR$(143));
1410 IFX<(EN+1) THENPX=PP:GOSUB1
020
1420 PP=PP+32:NEXTX
1430 SOUND200,1:GOTO1110
1440 '--- DR ITEM UPDATE
1450 SOUND200,1:GOSUB890:GOSUB60
0
1460 GOSUB100
1470 IF K>0 AND K<NE+1 THENGOSUB
800:GOTO1450
1480 IFK$="M" THENGOSUB200:GOTO3
290
1490 IFK$="R" THENGOSUB200:GOTO1
050
1500 IFK$="D" THEN680
1510 IFK$="C" THENGOSUB280:IFK>0
 AND K<NE+1 THEN1470 ELSEIFK$="R
" THEN1490 ELSEIFK$="X" THEN1550
 ELSE1450
1520 IFK$="N" THEN1590
1530 IFK$="P" THENGOSUB200:GOSUB
2710:GOTO1050
1540 IFK$="S" THENIO=2:GOSUB2480
:GOSUB200:GOTO1050
1550 IFK$="X" THENI(1)=1:GOSUB20
0:IFIE$="e" THEN1660 ELSE1050
1560 IFK$="O" THENGOSUB2260:GOTO
1050
1570 SOUND1,1:GOTO1460
1580 '--- NEW DR
1590 DL=DL+1:IFDL>EN THENDL=EN:G
OSUB1000:GOSUB200:GOTO1050
```


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For over 10 years, THE RAINBOW has been bringing RAINBOWfest to the CoCo Community. Being our 20th consecutive show, this RAINBOWfest promises to be a show to be talked about for time to come.

Come and walk the aisles — set your own pace between visiting the exhibits and attending the many invaluable, free seminars. Take part in the seminars offered, ranging in topics from BASIC to the sophisticated OS-9 operating system.

Stop by the RAINBOW booth and meet the faces behind THE RAINBOW. As well, those who are written about throughout its pages will be there to meet you and answer your questions. While you're at the RAINBOW booth, you can also take advantage of the reduced prices on the entire RAINBOW bookshelf. In addition, prices on all back issues will be reduced, giving you a chance to fill those holes in your library. You'll also meet many other people who share your interest in the Color Computer. RAINBOWfest is a person-to-person event, not to mention a tremendous learning experience in a fun and relaxed atmosphere.

While you're walking through the exhibit hall, keep your eyes open for CoCo Cat. Children and adults alike always enjoy the furry feline. And our mascot is no dummy — always looking for great deals, perhaps CoCo Cat has a hot tip for you.

RAINBOWfest is the place where commercial programmers show their newest programs and hardware for the first time. Plus, they will be listening to your comments and offering "special show prices." RAINBOWfest Chicago, is *the* place to get information on the capabilities of the CoCo, and find a terrific selection of the latest CoCo products. In exhibit after exhibit, there will be demonstrations, opportunities to try software and hardware, and special RAINBOWfest prices.

If you missed the fun at our last RAINBOWfest, why don't you make plans to join us in Chicago? For those members of the family who don't share your affinity toward the CoCo (for reasons we will never understand), there are many other attractions in the Chicago area.

Once again we are pleased to be holding RAINBOWfest at The Hyatt Regency-Woodfield, Schaumburg, Illinois. The show opens Friday evening with a session from 7:00 p.m. to 10:00 p.m. It's a daytime show Saturday - The CoCo Community Breakfast (separate ticket required) is at 8:00 a.m. sharp, and the exhibit hall opens promptly at 10:00 a.m. and runs through 5:00 p.m. On Sunday, the exhibit hall opens at 11:00 a.m., and the show closes at 3:00 p.m.

Tickets for RAINBOWfest may be obtained directly from THE RAINBOW. We'll also send you a reservation form so you can get a reduced room rate at the Hyatt Regency.

The POSH way to go. You can have your travel arrangements and hotel reservations handled through RAINBOW-affiliated Posh Travel Assistance, Inc., of Louisville. For the POSH treatment many of our exhibitors enjoy, call POSH at (502) 893-3311. All POSH services are available at no charge to RAINBOWfest attendees.

If your ticket order is one of the first five orders received from your state, you will receive a **Free RAINBOWfest T-Shirt!**

Show Information

RAINBOWfest - Chicago

Dates *- April 26-28, 1991*
Hotel *- The Hyatt Regency - Woodfield, Schaumburg*
For more info, call toll free
1 (800) 847-0309
in KY, call (502) 228-4492

```
1600 I=DL:I(1)=I-(SE-1):IFI(1)<1
 THENI(1)=1
1610 DR$(I)="*** NEW ***":DA(I)=
0:DB(I,0)=0:DY(I)=0:DF(I)=1:DB$(
I)="I":GOSUB890:GOSUB600:K$="C":
GOTO1510
1620 '--- SCROLL CR MONEY
1630 FORY=I(0)TO I(0)+2:IFCR(X,Y
)<>0 THENPRINT@PX,USINGN8$;CR(X,
Y);
1640 PX=PX+8:NEXTY:RETURN
1650 '--- CR DISPLAY
1660 IE$="i":GOSUB830:GOSUB260:G
OSUB240
1670 IFCL=0 THENPRINT@163,"enter
"BB$;"income"BB$"items";:PRINT@2
29,"hit"BB$"n"BB$"to"BB$"begin";
:GOTO1730
1680 PP=64:PX=PP:IX=1
1690 FORX=I(1) TO (I(1)+(SE-1)):
PRINT@PP+0,STRING$(32,CHR$(143))
;
1700 IFX<(IN+1) THEN1710 ELSE172
0
1710 PX=PP:PRINT@PP+0,IX$(IX);:P
X=PX+1:PRINT@PX,USINGA6$;CR$(X);
:PX=PX+7:GOSUB1630
1720 I(IX)=X:IX=IX+1:PP=PP+32:NE
XTX:SOUND200,1
1730 I=0:GOSUB100
1740 IFK$=CHR$(09) THENIFI(0)=NE
-2 THEN2060 ELSE2010
1750 IFK$=CHR$(08) THENIFI(0)=1
THEN2060 ELSE2020
1760 IFK$=CHR$(10) THENIFI(1)+(S
E-1)=CL THEN2060 ELSEIFCL<=SE TH
EN2060 ELSE1950
1770 IFK$=CHR$(21) THENIFI(0)=1
THEN2060 ELSEI(0)=1:GOTO2030
1780 IFK$=CHR$(93) THENIFI(0)=NE
-2 THEN2060 ELSEI(0)=NE-2:GOTO20
30
1790 IFK$=CHR$(95) THENIFI(1)=1
THEN2060 ELSEI(1)=1:GOTO1680
1800 IFK$=CHR$(91) THENIFI(1)+(S
E-1)=CL THEN2060 ELSEIFCL<=(SE-1
) THEN2060 ELSEI(1)=CL:GOTO1960
1810 IFK$=CHR$(94) THENIFI(1)=1
THEN2060 ELSE1980
1820 IFK$="N" THEN2220
1830 IFK$="X" THENI(1)=1:GOTO105
0
1840 IFK$="M" THEN3290
1850 IFCL=0 THEN1930
1860 IFK$="S" THENIO=2:GOSUB2480
:GOSUB200:GOTO1660
1870 IFK$="O" THENGOSUB2260:GOTO
1660
1880 IFK$="P" THENGOSUB2710:I(1)
=1:GOTO1660
1890 IFK$="M" THEN3290
1900 FORX=1TO SE:IFK$=I$(X) THEN
I=I(X)
1910 NEXTX:IFI=0 THEN1930 ELSEIF
I>CL THEN1930
1920 IFCR$(I)<>"" THEN2080
1930 SOUND1,1:GOTO1730
1940 '--- SCROLL CR UP/DOWN
1950 I(1)=I(1)+(SE-1)
1960 IFI(1)+(SE-1)>CL THENI(1)=C
L-(SE-1):IFI(1)<1 THENI(1)=1
1970 GOTO1680
1980 I(1)=I(1)-(SE-1):IF I(1)<1
THENI(1)=1
1990 GOTO1680
2000 '--- SCROLL CR SIDEWAYS
2010 I(0)=I(0)+1:GOTO2030
2020 I(0)=I(0)-1:IFI(0)<1 THENI(
0)=1
2030 GOSUB260:GOSUB240:PP=72:FOR
X=I(1) TO (I(1)+(SE-1))
2040 PRINT@PP,STRING$(23,CHR$(14
3));:IFX<(IN+1) THENPX=PP:GOSUB1
630
2050 PP=PP+32:NEXTX
2060 SOUND200,1:GOTO1730
2070 '--- CR ITEM UPDATE
2080 SOUND200,1:GOSUB890:GOSUB64
0
2090 GOSUB100
2100 IFK>0 ANDK<NE+1 THENGOSUB79
0:GOTO2080
2110 IFK$="M" THENGOSUB200:GOTO3
290
2120 IFK$="R" THENGOSUB200:GOTO1
660
2130 IFK$="D" THEN740
2140 IFK$="C" THENGOSUB280:IFK>0
 AND K<NE+1 THEN2100 ELSEIFK$="R
" THEN2120 ELSEIFK$="X" THEN2180
 ELSE2080
2150 IFK$="N" THEN2220
2160 IFK$="S" THENIO=2:GOSUB2480
:GOSUB200:GOTO1660
2170 IFK$="P" THENGOSUB200:GOSUB
2710:GOTO1660
2180 IFK$="X" THENI(1)=1:GOSUB20
0:IFIE$="e" THEN1660 ELSE1050
2190 IFK$="O" THENGOSUB2260:GOTO
1660
2200 SOUND1,1:GOTO2090
2210 '--- NEW CR
2220 CL=CL+1:IFCL>IN THENCL=IN:G
OSUB1000:GOSUB200:GOTO1660
2230 I=CL:I(1)=CL-(SE-1):IFI(1)<
1 THENI(1)=1
2240 CR$(I)="*** NEW ***":CA(I)=
0:CB$(I)="I":CB(I,0)=0:CF(I)=1:C
Y(I)=0:GOSUB890:GOSUB640:K$="C":
GOTO2140
2250 '--- OPEN NEW PERIOD
2260 CLS:SOUND200,1:PRINT@33,STR
ING$(30,CHR$(140)):I(0)=1:PRINTT
AB(3)"SHIFT AND OPEN NEW PERIOD"
:PRINT TAB(1)STRING$(30,CHR$(131
)):GOSUB2430
2270 PP=196:Y=0:FORX=1TO3:PRINT@
PP,USINGA5$;PD$(X+Y);:PRINT@PP+9
,USINGA5$;PD$(X+1+Y);:PRINT@PP+1
8,USINGA5$;PD$(X+2+Y);:PP=PP+64:
Y=Y+2:NEXTX
2280 IFCL=0 OR DL=0 THENPRINT@42
1,"MUST ENTER AT LEAST 1
  INCOME AND EXPENSE ITEM";:K$=I
NKEY$:IFK$="" THEN2280 ELSERETUR
N
2290 PRINT@460,"SURE?";:GOSUB60:
IFK$<>"Y" THENGOSUB200:RETURN
2300 GOSUB2390:PRINT@384,"    OP
EN PERIOD FOR: ";XX$;:GOSUB120:G
OSUB180:PRINT@448,"         shift
ing periods";
2310 FORX=1TO DL:DY(X)=DY(X)+DR(
X,1):IFDB$(X)="I" THENDB(X,0)=DB
(X,0)+DR(X,1) ELSEDB(X,0)=DB(X,0
)-DR(X,1)
2320 FORY=1TO NE-1:DR(X,Y)=DR(X,
Y+1):NEXTY:DR(X,NE)=0:IFDF(X)=1
THENDR(X,NE)=DA(X):NEXTX:GOTO234
0 ELSE2330
2330 Z1=0:FORZ=NE-(DF(X)-1) TO N
E-1:Z1=Z1+DR(X,Z):NEXTZ:IFZ1>0 T
HENNEXTX ELSEDR(X,NE)=DA(X):NEXT
X
```


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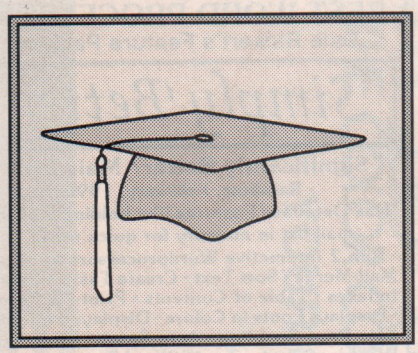
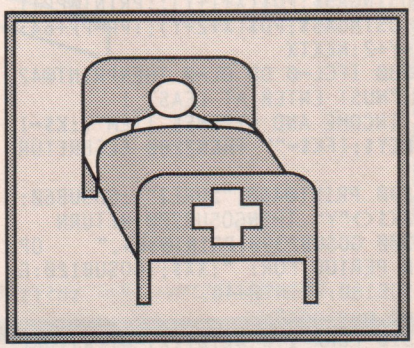
```
2340 FORX=1TO CL:CY(X)=CY(X)+CR(
X,1):IFCB$(X)="I" THENCB(X,Ø)=CB
(X,Ø)+CR(X,1) ELSECB(X,Ø)=CB(X,Ø
)-CR(X,1)
2350 FORY=1TO NE-1:CR(X,Y)=CR(X,
Y+1):NEXTY:CR(X,NE)=Ø:IFCF(X)=1
THENCR(X,NE)=CA(X):NEXTX:GOTO237
```

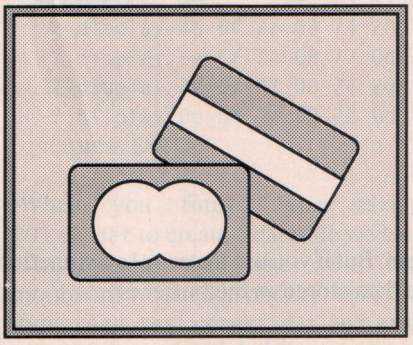


```
Ø
2360 Z1=Ø:FORZ=(NE-(CF(X)-1)) TO
 NE-1:Z1=Z1+CR(X,Z):NEXTZ:IFZ1>Ø
 THENNEXTX ELSECR(X,NE)=CA(X):NE
XTX
2370 FORY=1TO NE-1:PD$(Y)=PD$(Y+
1):NEXTY
2380 PD$(NE)=XX$:H$="Y":GOSUB200
:RETURN
2390 '--- GET DATE
2400 GOSUB180:GOSUB150:PRINT@448
,::LINEINPUT"  PERIOD MONTH (MM)
: ";XX$:IFXX$="" THEN2400 ELSEXM
$=LEFT$(XX$,2)
2410 GOSUB180:GOSUB150:PRINT@448
,::LINEINPUT"    PERIOD DAY (DD)
: ";XX$:IFXX$="" THEN2410 ELSEXD
$=LEFT$(XX$,2):XX$=XM$+"/"+XD$:R
ETURN
2420 '--- INIT DATES DISPLAY
2430 X$=STRING$(7,BB$):PP=163:Y=
Ø:FORX=1TO3:PRINT@PP,X$;:PRINT@P
P+1,"per";:PRINT@PP+Ø9,X$;:PRINT
@PP+10,"per";:PRINT@PP+18,X$;:PR
INT@PP+19,"per";
2440 POKE(1024+PP+5),(I(Ø)+X+Y+4
7):POKE(1024+PP+14),(I(Ø)+X+Y+1+
47):POKE(1024+PP+23),(I(Ø)+X+Y+2
+47)
2450 PRINT@PP+32,CHR$(133);:PRIN
T@PP+32+6,CHR$(138);:PRINT@PP+32
+Ø9,CHR$(133);:PRINT@PP+32+15,CH
R$(138);:PRINT@PP+32+18,CHR$(133
);:PRINT@PP+32+24,CHR$(138);:PP=
PP+64:Y=Y+2:NEXTX
2460 X$=STRING$(7,CHR$(131)):PRI
NT@PP,X$;:PRINT@PP+Ø9,X$;:PRINT@
PP+18,X$;:RETURN
2470 '--- I/O ROUTINES
2480 GOSUB130:SOUND200,1:IFIO=1
THENIO$="load" ELSEIO$="save"
2490 GOSUB180:PRINT@454,IO$+" fi
le - ";PW$;:IFIO=2 THEN2590
2500 '--- LOAD FILE
2510 SOUND220,1:FL$="B"+PW$+".BU
D":OPEN"I",#1,FL$:SOUND220,1:INP
UT#1,DL,CL
2520 FORX=1TO DL:INPUT#1,DR$(X),
DA(X),DB$(X),DB(X,Ø),DY(X),DF(X)
2530 FORY=1TO NE:INPUT#1,DR(X,Y)
:NEXTY,X
2540 FORX=1TO CL:INPUT#1,CR$(X),
CA(X),CB$(X),CB(X,Ø),CY(X),CF(X)
2550 FORY=1TO NE:INPUT#1,CR(X,Y)
:NEXTY,X
2560 FORX=1TO NE:INPUT#1,PD$(X):
NEXTX
2570 CLOSE#1:H$="Y":GOSUB120:GOS
UB200:RETURN
2580 '--- SAVE FILE
2590 SOUND220,1:OPEN "O",#1,FL$:
SOUND220,1:WRITE#1,DL,CL
2600 FORX=1TO DL:WRITE#1,DR$(X),
DA(X),DB$(X),DB(X,Ø),DY(X),DF(X)
2610 FORY=1TO NE:WRITE#1,DR(X,Y)
:NEXTY,X
2620 FORX=1TO CL:WRITE#1,CR$(X),
CA(X),CB$(X),CB(X,Ø),CY(X),CF(X)
2630 FORY=1TO NE:WRITE#1,CR(X,Y)
:NEXTY,X
2640 FORX=1TO NE:WRITE#1,PD$(X):
NEXTX
2650 CLOSE#1:GOSUB120:RETURN
2660 '--- CREATE NEW FILE
2670 CLS:SOUND200,1:FL$="B"+PW$+
".BUD":
2680 PRINT@33,;:PRINTTAB(1)STRIN
G$(30,CHR$(156));:PRINT"      EN
TER PERIOD DATES":PRINTTAB(1)STR
ING$(30,CHR$(147));:GOSUB2430
2690 PP=196:FORX=1TO NE:PRINT@41
8,"ENTER DATE FOR PERIOD";X;:GOS
UB2400:PD$(X)=XX$:PRINT@PP,PD$(X
);:PP=PP+9:IFX=3 ORX=6 THENPP=PP
+37:NEXTX: ELSENEXTX
2695 GOSUB160:GOTO1660
2700 '--- PRINT ROUTINE
2710 GOSUB180:PRINT@449,"
 TBLS:aMT   pYMTS/DUE   PRINT
      bAL   rETURN";:GOSUB100
2720 IFK$="A" THENGOSUB2760:GOTO
2790
2730 IFK$="P" THENGOSUB2760:GOTO
3100
2740 IFK$="B" THENGOSUB2760:GOTO
2890 ELSERETURN
2750 '--- SETUP PRINTER CODES
2760 GOSUB130:GOSUB180:PRINT@459
,"printing";
2770 POKE150,18:Q0$=CHR$(27)+CHR
$(23):Q1$=CHR$(27)+CHR$(66)+CHR$
(1):Q2$=CHR$(27)+CHR$(66)+CHR$(Ø
):Q3$=CHR$(27)+CHR$(31):Q4$=CHR$
(27)+CHR$(32):PRINT#-2,Q0$;:RETU
```



```
RN
2780 '--- PRINT TABLE
2790 GOSUB3030:PRINT#-2,Q1$;Q3$;
SØ$;"FORCASTED BUDGET AMOUNTS FO
R: ";PW$:LC=LC+1
2800 PRINT#-2:PRINT#-2,SØ$;"INCO
ME AMOUNTS":LC=LC+2:GOSUB3010
2810 FORX=1TO CL:PRINT#-2,S2$;S2
$;:PRINT#-2,USINGA8$;CR$(X);:PRI
NT#-2," ";:FORY=1TO NE:PRINT#-2,
USINGN7$;CR(X,Y);:PRINT#-2,S2$;:
NEXTY:PRINT#-2:LC=LC+1:GOSUB2990
:NEXTX
2820 PRINT#-2,Q1$;Q3$;:GOSUB3080
:PRINT#-2,S2$;S2$;"TOTAL     ";:F
ORX=1TO NE:PRINT#-2,USINGN7$;CT(
X);:PRINT#-2,S2$;:NEXTX:PRINT#-2
,Q2$;Q4$:LC=LC+1:GOSUB2990
2830 PRINT#-2:PRINT#-2,Q1$;Q3$;S
Ø$;"EXPENSE AMOUNTS":LC=LC+2:GOS
UB3010
2840 FORX=1TO DL:PRINT#-2,S2$;S2
$;:PRINT#-2,USINGA8$;DR$(X);:PRI
NT#-2," ";:FORY=1TO NE:PRINT#-2,
USINGN7$;DR(X,Y);:PRINT#-2,S2$;:
NEXTY:PRINT#-2:LC=LC+1:GOSUB2990
;NEXTX
2850 PRINT#-2,Q1$;Q3$;:GOSUB3080
:PRINT#-2,S2$;S2$;"TOTAL     ";:F
ORX=1TO NE:PRINT#-2,USINGN7$;DT(
X);:PRINT#-2,S2$;:NEXTX:PRINT#-2
,Q2$;Q4$:LC=LC+1:GOSUB2990
2860 PRINT#-2:PRINT#-2,Q1$;Q3$;S
Ø$;"BUDGET PERIOD BALANCE":LC=LC
+2:GOSUB3010
2870 PRINT#-2,Q1$;Q3$;S2$;S2$;"B
ALANCE  ";:FORX=1TO NE:PRINT#-2,
USINGN7$;BL(X);:PRINT#-2,S2$;:NE
XTX:PRINT#-2,Q1$;Q3$:LC=LC+1:GOS
UB2970:GOSUB120:RETURN
2880 '---- PRINT BALANCES
2890 GOSUB3030:PRINT#-2,Q1$;Q3$;
SØ$;"FORCASTED BUDGET BALANCES F
OR: ";PW$:LC=LC+1
2900 PRINT#-2:PRINT#-2,SØ$;"INCO
ME BALANCES":LC=LC+2:GOSUB3010
2910 FORX=1TO CL:PRINT#-2,S2$;S2
$;:PRINT#-2,USINGA8$;CR$(X);:PRI
NT#-2,"";:FORY=1TO NE:IFCB$(X)="
I" THENCB(X,Y)=CB(X,Y-1)+CR(X,Y)
 ELSECB(X,Y)=CB(X,Y-1)-CR(X,Y)
2920 PRINT#-2,USINGN9$;CB(X,Y);:
PRINT#-2,"";:NEXTY:PRINT#-2:LC=L
C+1:GOSUB2990:NEXTX
2930 PRINT#-2:PRINT#-2,Q1$;Q3$;S
Ø$;"EXPENSE BALANCES";Q2$;Q4$:LC
=LC+2:GOSUB3010
2940 FORX=1TO DL:PRINT#-2,S2$;S2
$;:PRINT#-2,USINGA8$;DR$(X);:PRI
NT#-2,"";:FOR Y=1TO NE:IFDB$(X)=
"I" THENDB(X,Y)=DB(X,Y-1)+DR(X,Y
) ELSEDB(X,Y)=DB(X,Y-1)-DR(X,Y)
2950 PRINT#-2,USINGN9$;DB(X,Y);:
PRINT#-2,"";:NEXTY:PRINT#-2:LC=L
C+1:GOSUB2990:NEXTX:GOSUB2970:GO
SUB120:RETURN
2960 '--- END OF PAGE LINES
2970 FORW=LC TO 65:PRINT#-2:NEXT
W:LC=Ø:RETURN
2980 '--- PAGE
2990 IFLC<60 THENRETURN ELSEGOSU
B2970:FORW=1TO 5:PRINT#-2:NEXTW:
LC=5:GOSUB3010:RETURN
3000 '--- PRINT DATE LINE
3010 PRINT#-2,Q1$;Q3$;:GOSUB3080
:PRINT#-2,S2$;S2$;"PERIOD>    ";
:FORW=1TO NE:PRINT#-2,PD$(W);S2$
;S2$;:NEXTW:PRINT#-2:GOSUB3080:P
RINT#-2,Q2$;Q4$;:LC=LC+1:RETURN
3020 '--- PRINT HEADING
3030 FORX=1TO5:PRINT#-2:NEXTX:PR
INT#-2,Q1$;Q3$;SØ$;"HOME BUDGET
ANALYST";:PRINT#-2,Q2$;Q4$:LC=6:
RETURN
3040 '--- PRINT TITLE LINE
3050 PRINT#-2,Q1$;Q3$;:GOSUB3080
```

```
:PRINT#-2,SØ$;S5$;"          CURR
ENT     YTD       CURRENT  REMAIN
ING"
3060 PRINT#-2,S5$;SØ$;"DESC
 AMOUNT    BALANCE     BALANCE    B
ALANCE":GOSUB3080:PRINT#-2,Q2$;Q
4$;:LC=LC+2:RETURN
3070 '--- PRINT DASH LINE
3080 PRINT#-2,S2$;S2$;STRING$(8,
"-");:FORW=1TO NE:PRINT#-2,STRIN
G$(9,"-");:NEXTW:PRINT#-2:LC=LC+
1:RETURN
3090 '--- PRINT SINGLE PERIOD RO
UTINE
3100 GOSUB3030:PRINT#-2,Q1$;Q3$;
SØ$;"PAYMENTS FOR: ";PW$;S2$;S5$
;" BUDGET PERIOD: ";PD$(1):LC=LC
+1
3110 PRINT#-2:PRINT#-2,SØ$;"INCO
ME ITEMS":LC=LC+2:GOSUB3050:FORX
=1TO CL:IFCR(X,1)=Ø THEN3170
3120 PRINT#-2,S5$;SØ$;:PRINT#-2,
USINGA8$;CR$(X);:PRINT#-2," ";:P
RINT#-2,USINGN7$;CR(X,1);:PRINT#
-2,S2$;
3130 CY=CY(X)+CR(X,1):PRINT#-2,U
SINGN9$;CY;:PRINT#-2,S2$;:IFCB$(
X)="I" THEN3150
3140 CB(X,1)=CB(X,Ø)-CR(X,1):PRI
NT#-2,S5$;SØ$;:PRINT#-2,USINGN9$
;CB(X,1);:GOTO3160
3150 CB(X,1)=CB(X,Ø)+CR(X,1):PRI
NT#-2,USINGN9$;CB(X,1);
3160 PRINT#-2,S5$;SØ$;:PRINT#-2:
LC=LC+1:GOSUB2990
3170 NEXTX
3180 PRINT#-2,Q1$;Q3$;:GOSUB3080
:PRINT#-2,S5$;SØ$;"TOTAL     ";:P
RINT#-2,USINGN7$;CT(1);:PRINT#-2
,S2$;:PRINT#-2,Q2$;Q4$:LC=LC+1:G
OSUB2990
3190 PRINT#-2:PRINT#-2,Q1$;Q3$;S
Ø$;"EXPENSE ITEMS":LC=LC+2:GOSUB
3050
3200 FORX=1TO DL:IFDR(X,1)=Ø THE
N3260
3210 PRINT#-2,S5$;SØ$;:PRINT#-2,
USINGA8$;DR$(X);:PRINT#-2," ";:P
RINT#-2,USINGN7$;DR(X,1);:PRINT#
-2,S2$;
3220 DY=DY(X)+DR(X,1):PRINT#-2,U
SINGN9$;DY;:PRINT#-2,S2$;:IFDB$(
X)="I" THEN3240
3230 DB(X,1)=DB(X,Ø)-DR(X,1):PRI
NT#-2,SØ$;:PRINT#-2,USINGN9$;DB(
X,1);:GOTO3250
3240 DB(X,1)=DB(X,Ø)+DR(X,1):PRI
NT#-2,USINGN9$;DB(X,1);
3250 PRINT#-2,S5$;SØ$;:PRINT#-2:
LC=LC+1:GOSUB2990
3260 NEXTX
3270 PRINT#-2,Q1$;Q3$;:GOSUB3080
:PRINT#-2,S5$;SØ$;"TOTAL     ";:P
RINT#-2,USINGN7$;DT(1);:PRINT#-2
,"    BUDGET BALANCE ";:PRINT#-2
,USINGN7$;BL(1);:PRINT#-2,S2$;:L
```



```
C=LC+1:GOSUB2990:GOSUB2970:GOSUB
120:RETURN
3280 '--- MENU
3290 CLS:SOUND200,1:PRINT@64,"";
:GOSUB3560
3300 PRINT@256,"   sAVE FILE
 pRINT             oPEN NEW PER
 rEAD NEW FILE     iNCOME DSPLY
 eXPENSE DSPLY     qUIT";
3310 PRINT@419,"CURRENT FILE - "
;PW$;
3320 GOSUB3650:IFK$="" THEN3320
3330 IFK$="S" THENIO=2:GOSUB2480
:GOSUB200:GOTO3290
3340 IFK$="P" THENGOSUB2710:I(1)
=1:GOTO3290
3350 IFK$="O" THENGOSUB2260:GOTO
3290
3360 IFK$="R" THENRUN
3370 IFK$="I" THENI(1)=1:GOTO166
Ø
3380 IFK$="E" THENI(1)=1:GOTO105
Ø
3390 IFK$="X" THENGOSUB130:SAVE"
BUD.BAS":GOSUB120:GOTO3320
3400 IFK$="Q" THENGOSUB130:CLS:P
RINT"BUDGET PROGRAM TERMINATED":
END
3410 GOTO3320
3420 '--- PROGRAM INIT
3430 CLEAR1100:GOSUB120:EN=45:IN
=15:NE=9:SE=9
3440 DIMDR$(EN),DA(EN),DB$(EN),D
Y(EN),DF(EN)
3450 DIMCR$(IN),CA(IN),CB$(IN),C
Y(IN),CF(IN)
3460 DIMDR(EN,NE),DB(EN,NE):DIMC
R(IN,NE),CB(IN,NE)
3470 DIMPD$(NE),BL(NE),DT(NE),CT
(NE)
3480 DIMI$(SE),I(SE),IX$(SE)
3490 I(Ø)=1:DL=Ø:CL=Ø
3500 FORX=1TO SE:READIX$(X),I$(X
),I(X):NEXTX
3510 DATA a,A,1,b,B,2,c,C,3,d,D,
4,e,E,5,f,F,6,g,G,7,h,H,8,i,I,9
3520 N1$="#":N7$="####.##":N8$="
####.##-":N9$="######.##-"
3530 A5$="%    %":A6$="%      %":A
8$="%      %"
3540 BB$=CHR$(128):S2$="  ":S5$=
"     ":SØ$="          ":GOSUB35
60:GOTO3590
3550 '--- TITLE SCREEN
3560 SOUND200,1:CLS:PRINT@100,"h
ome";BB$;"budget";BB$;"analyst";
BB$;BB$:POKE(1024+121),52:POKE(1
024+122),46:POKE(1024+123),48:PR
INT
3570 PRINT"    BY: GLEN DUFUR":P
RINT"    COPYRIGHT (C) 1989":RET
URN
3580 '--- PASSWORD
3590 PRINT:PRINTTAB(4):LINEINPUT
"PASSWORD: ";PW$:PW$=LEFT$(PW$,5
)
3600 PRINT@324,"lOAD EXISTING BU
DGET":PRINT@388,"cREATE NEW BUDG
ET":PRINT@456,"SELECT OPTION"
3610 GOSUB3650:IFK$="" THEN3610
3620 IFK$="C" THEN2670
3630 IFK$="L" THENIO=1:GOSUB2480
:GOTO1660
3640 SOUND1,5:GOTO3610
3650 IFXX$=CHR$(145) THENXX$=CHR
$(146):XY$=CHR$(148):XZ$=CHR$(15
Ø): ELSEXX$=CHR$(145):XY$=CHR$(1
52):XZ$=CHR$(153)
3660 PRINT@66,CHR$(138);:PRINTST
RING$(26,XX$);CHR$(133);:PRINT@1
30,CHR$(138);STRING$(26,XY$);CHR
$(133);
3670 K$=INKEY$:PRINT@99,BB$;:PRI
NT@124,BB$;:RETURN
3680 '---PCLEAR ROUTINE
3690 PCLEAR1:GOTO3430
```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'tis Still the C Zen

by Greg Law
Technical Editor

Previous installments in this series have shown how to open existing files, create new files and check for the existence of files. The actual task of reading and writing using the low-level functions is accomplished with `read()`, `readln()`, `write()` and `writeln()`. For assembly language buffs, these are direct equivalents of the `I$Read`, `I$ReadLn`, `I$Write` and `I$WritLn` system calls. That is, the `read()` function passes its parameters directly to the `I$Read` system call. The primary purpose of `read()` and `write()` is to read and write a stream of binary data, although both functions work with streams of ASCII data just as well. On the other hand, `readln()` and `writeln()` are primarily intended to read and write ASCII data, as well as use the line-editing capabilities built into the sequential character file (SCF) manager.

Let's carry this definition a bit further. Assume you have a program that reads 12 characters from the keyboard, and you type the following as input:

```
Now\bt not\bw\n
```

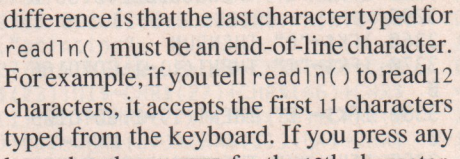
`\b` is the backspace character and `\n` is the carriage return character. If you use the `read()` function, the actual data stored in the buffer is

```
Now\bt not\bw\n
```

As you can see, the backspace characters are stored in the buffer exactly as you typed them. But if you use the `readln()` function, the data stored in the buffer is

```
Not now\n
```

In this case, the line-editing capabilities built into SCF take over and interpret the backspace characters. Another difference between these two functions is that `read()` reads the specified number of characters from the input device. In other words, if you tell `read()` to read 12 characters, it reads exactly 12 characters unless it encounters an end-of-line character, which is usually a carriage return or the ENTER key. Also, `readln()` reads the specified number of characters and stops reading when it encounters an end-of-line character. The difference is that the last character typed for `readln()` must be an end-of-line character. For example, if you tell `readln()` to read 12 characters, it accepts the first 11 characters typed from the keyboard. If you press any key other than ENTER for the 12th character, the speaker beeps and the character is discarded (or thrown into the bit bucket).



Experiment with the sample program in Listing 1 to get used to the differences between `read()` and `readln()`. First, a character array is declared that can hold up to 25 characters. A loop is used to initialize the contents of the array to spaces. This is done so as to know exactly what is stored in the array to check the results. Otherwise, the character array would contain miscellaneous garbage and the results of the test would be meaningless. In the next step, `read()` is called to read 12 characters from the keyboard into the array. The number of characters actually read is assigned to the variable `count`. This is where the fun begins. The `printf()` function is used to tell the number of characters read from the keyboard. The hexadecimal values for the characters in the array are then printed on the screen. This process is repeated for the `readln()` function so you can compare the results. Run the program and type `Now\bt not\bw` twice. The following is printed on the screen:

```
Read 12 characters
4E 6F 77 08 74 20 6E 6F 74 08 77 0D 20..

Read 8 characters
4E 6F 74 20 6E 6F 77 0D 20...
```

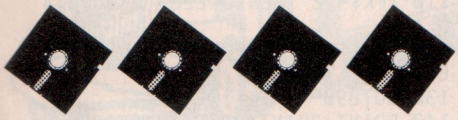
Remember I am using `\b` to represent the backspace character, which is the left arrow on the keyboard. As you can see, the `read()` function reads the input typed on the keyboard exactly as you typed it and the last character read is the carriage return. On the other hand, the `readln()` function erased the previous character typed each time backspace was pressed. There is another subtle difference you should have noticed on the screen. During the `read()` call each time backspace was pressed the cursor moved to the left one position, but the character at that position remained on the screen. During the `readln()` call, each time backspace was pressed the cursor moved to the left one position and the character at that position was erased.

Run the program once more, but this time type `Not now` without the backspaces and press ENTER. This time both `read()` and `readln()` act exactly the same. For the final comparison run the program and type `Now is the time` once to test the `read()` function. For best results wait a second or two before pressing each key and stop typing when `printf()` prints the results on the screen. `read()` stopped reading the input and the results were printed immediately

---

In addition to being OS-9 Online SIGop, Greg Law enjoys programming on all types of computers and has worked on systems ranging from the CoCo to the Burroughs B6700 super mainframe. He lives in Louisville, Kentucky.

after the t in time was pressed. Type `Now is the time` again to test the `readln()` function. Did you hear the speaker beep when you pressed t in time? If you complete the sentence by pressing i, m and e, the speaker beeps each time you press a key. Complete the input by pressing ENTER. As mentioned above, the last character typed in response to `readln()` must be a carriage return, any other characters typed beyond this point are ignored.



So far we have examined the effects of `read()` and `readln()` only on sequential character devices, such as the keyboard and the monitor. The end result is that SCF has given us the ability to use its line editing functions to interpret backspaces and such. But what are the effects of using `read()` and `readln()` from a disk file? Type the following to build a test file:

```
build make_test
? display 4e 6f 77 08 74 20
? display 6e 6f 74 08 77 0d
? display 4e 6f 77 08 74 20
? display 6e 6f 74 08 77 0d
? press ENTER
```

When you finish, type `make_test >test.dat` to create a data file we can use. This creates the same data (Now\bt not\bw\n) we used in our first test. Finally, type `read_test <test.dat` and examine the results printed on the screen. Both `read()` and `readln()` read the data exactly as it was stored in the file and the backspaces were not interpreted. For another test, type the following:

```
build test2.dat
? Now is the time
? Now is the time
? press ENTER
```

Type `read_test <test2.dat` and press ENTER. This time `read()` reads exactly 12 characters from the file and `readln()` reads the remainder of the sentence up to the carriage return. If you haven't already guessed, the second sentence hasn't been read yet.

The `write()` and `writeln()` functions work in the same manner as the `read()` and `readln()` functions. That is, the data given to `write()` is written on the device with no conversions whatsoever. On the other hand, the data given to `writeln()` is passed through the SCF editing functions. Also be aware that `writeln()` writes the data in the buffer up to the specified number of bytes, but `writeln()` stops short if a carriage return is encountered.

As an exercise, create a couple of short programs and experiment with these four functions. What other information can you discover about the effects of these functions on SCF and RBF devices?

OS-9

The Listing: `read_test.c`

```
main()
{
     char array[25];
     int  count;
     int  i;

     for(i = 0; i < 25; i++)
          array[i] = 32;

     count = read(0, array, 12);
     printf("\nRead %d characters\n", count);

     for(i = 0; i < 25; i++)
          printf("%02X ", (int) array[i]);

     printf("\n");

     for(i = 0; i < 25; i++)
          array[i] = 32;

     count = readln(0, array, 12);
     printf("Read %d characters\n", count);

     for(i = 0; i < 25; i++)
          printf("%02X ", (int) array[i]);

     printf("\n");
}
```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Print Utility 16K Extended

Neat Labels

by Keiran Kenny

As a tape user, I do not like database programs that require me to load a working program and then load a file that has been saved separately (and probably on another tape). I developed a program to retain a limited list of addresses in data lines as in the examples in lines 1000 to 1040 and print any or all of them on 4½-by-1½ fanfold labels. It can also be used to type one-time addresses that do not need to be retained and print them on labels.

To use the program, type a few data lines as in the examples. You can have any number from one to seven lines in each address. The length of a line should not exceed 31 characters. Line 1020 contains only one line. Each data line must end with XX and the last data line must read DATA ZZ as in Line 2000.

To begin the program, select Option 1 on the menu screen. This brings the first address to the screen and a prompt to press the space bar to print. Each address is held on the screen for a count of 1200 by the loop in Line 230. If you don't press the space bar within this time, the next address is displayed. The value of DL is established in Line 10 and can be changed to vary the duration of the display.

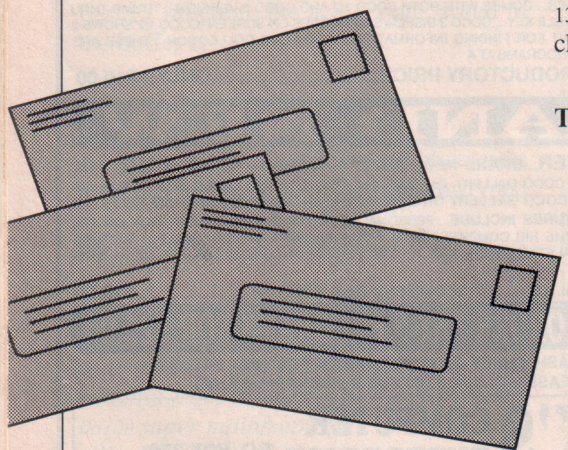
To print an address, have the top of your first label flush with the top of the ribbon, the left edge of the label at Position 0, and press the space bar. The label is printed with the text centered. The printer then advances to the top of the next label.

Line 290 establishes how many blank lines (TM) are to be printed at the top of the label. The loop in lines 300 to 330 sets the length of the longest line in your address. This line is centered under TAB(20), TB, as in Line 20. The loop in Line 380 prints the number of blank lines needed at the bottom of the label to bring up the next label.

Once the addresses in the data lines have been printed, you are returned to the menu. Press 2 to type and print a one-time address. The entry POKE282,0 in Line 110 puts the CoCo in upper/lowercase mode and POKE282,255 in lines 100 and 120 puts it in an all capitals mode. You can type up to seven lines, but if you have less than seven, type the last line and press SHIFT-up arrow. A little left-arrow appears on the screen and the address is printed as before.

The program is not fast, but I have found it simple and effective enough for a limited purpose. If you do not have Extended Color BASIC use INPUT instead of LINEINPUT in Line 260, but avoid using the comma and the colon when typing one-time addresses. They can be used in a data line if the text is in quotes.

Line 30 sets the transmission rate at 2400 baud. This can be changed for compatibility with your printer. The controls for NLQ bold in Line 150 are for a DMP-130A printer. This line can be omitted or changed as needed for your printer.



The Listing: LABELS

```
0 'NEAT LABELS
1 'WRITTEN BY KEIRAN KENNY
2 'COPYRIGHT (C) JANUARY 1991
3 'BY FALSOFT, INC.
10 CLS:DL=1200
20 TB=20 'TAB(20)
30 POKE150,18 '2400 baud.
40 PRINT@64,"DO YOU WANT TO:":PRINT
50 PRINTTAB(2)"1. PRINT ADDRESSES IN DATA?":PRINT
60 PRINTTAB(2)"2. TYPE AND PRINT ONE-OFF",TAB(5)"ADDRESSES?":PRINT
70 PRINTTAB(2)"3. END PROGRAM?":PRINT
80 PRINTTAB(8)"PRESS 1, 2 OR 3."
90 K$=INKEY$:IFK$=""THEN90
100 IFK$="1"THENPOKE282,255:GOTO140
110 IFK$="2"THENPOKE282,0:GOTO140
120 IFK$="3"THENPOKE282,255:CLS:END
130 GOTO90
140 PRINT:PRINT"PRINTER READY? - PRESS ANY KEY.":EXEC44539
150 PRINT#-2,CHR$(27);CHR$(18);CHR$(27);CHR$(31); 'NLQ Bold
160 IFK$="2"THENCLS:PRINT@32,"TYPE ADDRESS:":PRINT@64:GOTO250
170 N=N+1:READN$(N):IFN$(N)="ZZ"THENCLS:RESTORE:N=0:PRINT"DATA END.":GOTO40ELSEIFN$(N)="XX"THENN=N-1:CLS:GOTO180ELSE170
180 PRINT@128
190 FORT=1TON
200 PRINTN$(T)
210 NEXT
220 PRINT:PRINTTAB(3)"PRESS SPACEBAR TO PRINT."
230 FORD=1TODL:NEXT:IFINKEY$=CHR$(32)THEN290ELSEN=0:CLS:GOTO170
240 PRINT:PRINTTAB(3)"PRINT? Y/N"
250 FORN=1TO7
260 PRINT"LINE"N;CHR$(8)":";:LINEINPUTN$(N)
270 IFN=7THEN290ELSEIFN$(N)=CHR$(95)THENN=N-1:GOTO290
280 NEXT
290 TM=INT((9-N)/2)
300 FORT=1TON
310 IFLEN(N$(T))>Z THEN320ELSE330
320 Z=LEN(N$(T))
330 NEXT
340 FORD=1TOTM:PRINT#-2:NEXT
350 FORT=1TON
360 PRINT#-2,TAB(TB-(Z/2))N$(T)
370 NEXT
380 FORD=1TO9-N-TM:PRINT#-2:NEXT
390 Z=0:N=0:IFK$="1"THEN170ELSE40
1000 DATA The Tandy Corporation,300 One Tandy Center,Fort Worth TX,U.S.A. 76102,XX
1010 DATA The Submissions Editor,RAINBOW,P.O. Box 385,Prospect KY,U.S.A. 40059,XX
1020 DATA MR. William P. Nutt,XX
1030 DATA Keiran Kenny,2/45 Cremorne Road,Cremorne NSW,Australia 2090,XX
2000 DATA ZZ
```

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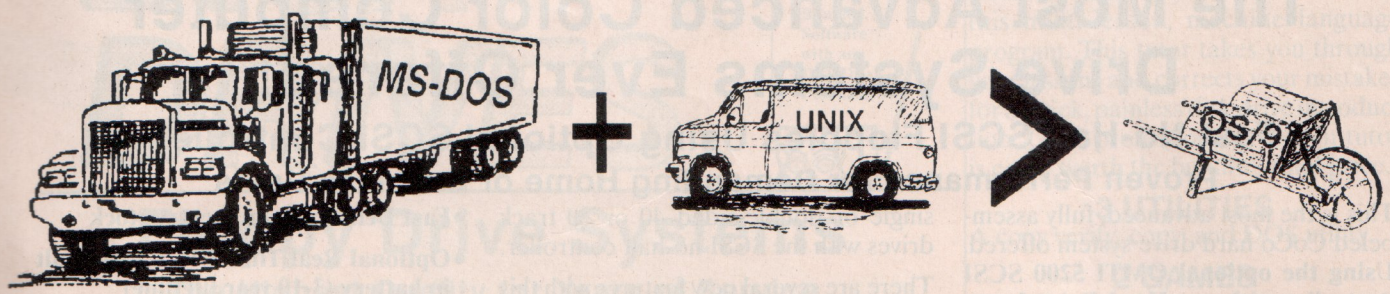

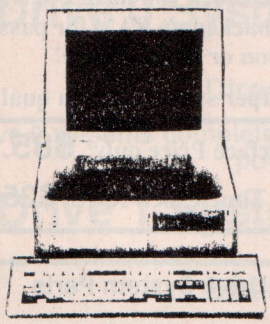

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A quick look at the basics of graphics animation

Jumpman

by Phil Stroffolino

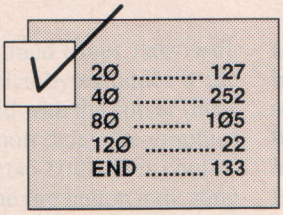
Computer animation can be frustrating and time-consuming for novices as well as for the most experienced programmers. Especially frustrating are the so-called experts who constantly criticize Extended BASIC as being inadequate for video games and other applications involving speed or graphics. Machine language is fast, but in many cases it is possible to push BASIC to its limits and accomplish the same tasks. *Jumpman* is a program written entirely in BASIC for use with a CoCo 1, 2 or 3 with at least 32K of memory.

Jumpman uses intricate techniques to move objects, scroll the screen and manipulate the playing character. Use the left and right arrow keys to move the character, and the space bar to cause him to jump over obstacles that appear on the screen.

Most of the program's work is performed using `GET` and `PUT`. The flowers and "arrows" used as obstacles are drawn in Line 10 and stored in variables `E` and `F`. The three positions used by Jumpman are drawn in lines 20 and 30. They are stored in variables `M1`, `M2` and `M3`. The "dead" Jumpman is drawn in Line 40 and stored in `M4`. Finally the title screen is drawn in Line 50, and the game starts at Line 60.

I hope you'll find *Jumpman* enjoyable, as well as a helpful source when writing your own animation routines. ❑

Phil Stroffolino is a self-taught programmer specializing in video games. He is currently performing contract work for local businesses. He can be contacted at 5858 Southminster, Houston, TX 77035. Please include an SASE when requesting a reply.



The Listing: JUMPMAN

```
Ø 'JUMPMAP
1 'WRITTEN BY PHIL STROFFOLINO
2 'COPYRIGHT FEBRUARY 1991
3 'BY FALSOFT, INC.
4 'RAINBOW MAGAZINE
1Ø CLSØ:CLEAR5ØØ:PCLEAR8:PMODE1,
1:PCLS3:DIMM1(12),M2(12),M3(12),
M4(12),F(8),E(8):DRAW"S8BM128,4C
2NE2F2BR3H2E2BR2BDGFBM128,96C4DR
2DER2DERUBL3C2LBD2C1D2L2HBR7GL2N
U2DL":GET(128,Ø)-(142,8),F:GET(1
28,96)-(142,138),E
2Ø DRAW"BM1Ø,ØC4R5FL8GNR11GDER2D
2EUR3C2R2DL4GR9FL4FR3GL2C4DLU2HD
2HUC2L6U2LD2HD2R7FNL7FL4C1L3GR11
DL11DR11GL9BE9LUR":GET(Ø,Ø)-(3Ø,
3Ø),M1:PUT(32,Ø)-(62,3Ø),M1:DRAW
"BM2,2ØC4R4FL5FR5C2R3UNL3BR4UBG4
C4L5DR6BM32,18EFLGR3DNL2RC2R2UL2
BR1ØRD2C4HLFL3GR4GL2
3Ø DRAW"BL8EL4DR2DLBM72,ØR5FL8GN
R11GDER2D2EUR3C2R2DL4GR9FL4FR3GL
2C4DLU2HD2HUC2L6U2LD2HD2R7FNL7FL
4C1L3FR6GL5GR8DL8FR8C4R2EL3UR3UL
3ER2BDBL13C2DLULUR3C4NR2DNR2BD3G
U2LD2BLBUBE1ØC1RUL":GET(Ø,Ø)-(3Ø
,3Ø),M1:GET(32,Ø)-(62,3Ø),M2:GET
(64,Ø)-(94,3Ø),M3
4Ø DRAW"BM98,ØC4D4EUFNU3ED3ENU4R
U2FNU3RURNU2R2NU2R2NU2GC1D2LU2LD
2HC2UGLDNL2R2BR4U2F2LFL14UR2ULBD
3NR8LFR7FNL4FL3FR4BU2REL2HR3BL4C
4FL2FRBD4R2FL3BL3L3DNR4BH6NRD2C2
D2FNR2U2NR3U2R2HC1R3GR3FNL6DNR4L
3DNR6DLUL2":GET(96,Ø)-(126,3Ø),M
4
5Ø CLS6:SCREEN0,Ø:PMODE3,1:PCLS3
:DRAW"BM40,38C4D12NL12BR4NU12R12
NU12BR4U12F6E6D12BR4U12R12D6NL12
BD6BR4U12F6E6D12BR4U12R12D6NL12D
6BR4U12F12U12":SCREEN1,Ø:B=1:FOR
I=2TO14STEP2:COLORB:B=3-B:LINE(I
,I)-(254-I,96-I),PSET,B:NEXT
6Ø J(7)=-24:J(6)=-16:J(5)=-8:J(4
)=Ø:J(3)=8:J(2)=16:J(1)=24:PMODE
3,5:PCLS3:FORI=ØTO3:PMODE1,I+4:C
OLOR4:LINE(Ø,178)-(255,19Ø),PSET
,BF:DRAW"C2BMØ,176R127BMØ,191R12
7":B=I:X=Ø
7Ø B=B+1+4*(B=3):IFB=ØTHENDRAW"B
M=X;,176DNL4NR4DNLNRD3NLNRDNL4R4
8Ø X=X+16:IFX<256THEN7ØELSENEXT
9Ø PMODE3,1:PCLS3:L=Ø:C=-8:A=Ø:B
=5:W=1:X=32:K=Ø:Y=78:J=Ø:M=Ø:S=Ø
:PMODE1,3:SCREEN1,Ø:POKE65478,Ø
1ØØ W=1:PMODE1,W:PCOPYB TOW:Q=X:
IFK THEN16ØELSEIFJ THEN17ØELSEIF
M THENPUT(X,Y)-(X+3Ø,Y-3Ø),M2 EL
SEPUT(X,Y)-(X+3Ø,Y-3Ø),M1
11Ø I$=INKEY$:H=(PEEK(343)=247)-
(PEEK(344)=247):J=-7*(I$=" "):IF
H>ØTHENX=X+S:S=S-8*(S<16):M=M=ØE
LSEIFS THENM=Ø:X=X+S:S=S-8ELSEIF
H<ØTHENX=X+8*(X>Ø):M=M=ØELSEM=Ø
12Ø A=A-16:IFA<ØTHENA=256:R=64-8
*RND(2)ELSEPUT(A,R)-(A+14,R+8),F
:IFY<R+6ORA>Q+24ORA<Q-8THENELSEK
=1
13Ø IFC<-16THENC=24ØELSEIFC>=ØTH
ENPUT(C,68)-(C+14,78),E:IFY<78OR
C>Q+24ORC<Q-8THENELSEK=1
14Ø IFX>112THENB=B+1+4*(B=8):X=X
-16:A=A-16:C=C-16
15Ø PCOPY1TO3:GOTO1ØØ
16Ø L=L+1:PUT(Q,Y)-(Q+3Ø,Y-3Ø),M
4:PLAY"O1T24L24CGE-":IFL<8THEN12
ØELSEPLAY"O1T6L4V>CV<DV>E-V<L2AP
1":GOTO5Ø
17Ø Y=Y+J(J):J=J-1:PUT(X,Y)-(X+3
Ø,Y-3Ø),M3:X=X+S:GOTO12Ø
```

Novices Niche

Financial Utility 16K Extended

Loans

by Steve Knapik

This program can be used to quickly and accurately find monthly payments and interest on loans or mortgages. It is very helpful when considering your loan options.

Upon running *Loans* you are asked to enter the loan amount. Enter a figure in whole dollars, rounding to the closest dollar value. Next you are asked for the interest rate. The program takes care of conversions so you should enter this as a whole number with a decimal portion, if necessary. For example, enter 11.5, not .115, for an interest rate of 11½ percent. Finally, enter the number of years over which you will carry the loan. The results are printed onscreen. CoCo 1 and 2 should remove WIDTH32 from Line 100.

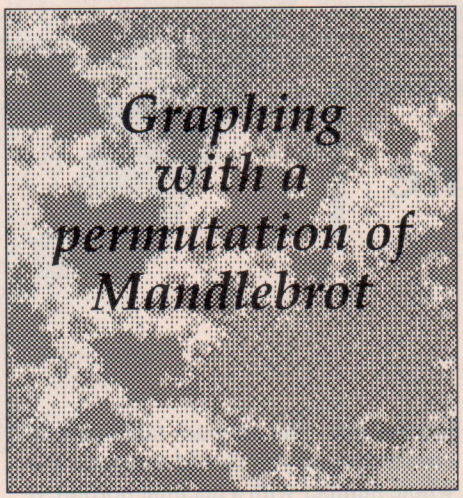
The Listing: LOANS

```
1Ø 'LOANS
11 'WRITTEN BY STEVE KNAPIX
12 'COPYRIGHT FEBRUARY 1991
13 'BY FALSOFT, INC.
14 'RAINBOW MAGAZINE
2Ø REM  Ø.793 K
1ØØ WIDTH32 : CLS
11Ø CLS:PRINT"  ===> LOAN CALCUL
ATIONS"
12Ø PRINT:PRINT"WHAT IS THE AMOU
NT OF THE LOAN"
13Ø INPUT"IN WHOLE DOLLARS";A
14Ø IF A=Ø THEN 11Ø
15Ø A=ABS(A) : A=INT(A)
16Ø IF A>25ØØØØ THEN 41Ø
17Ø PRINT:INPUT"RATE OF INTEREST
";R
18Ø PRINT:INPUT"NUMBER OF YEARS
";Y
19Ø N=Y*12 : R=ABS(R) : M=R/12ØØ
2ØØ GOSUB 36Ø : W=1
21Ø FOR J = 1 TO N : W=W*(1+M) :
 NEXT J
22Ø P=(A*M*W)/(W-1)
23Ø P=INT(P*1ØØ+.99)/1ØØ
24Ø K=N*P : L=K-A
25Ø K=INT(K) : L=INT(L)
26Ø SOUND 2ØØ,Ø1 : CLS : PRINT
27Ø PRINT"AMT. OF LOAN : $"A
28Ø PRINT
29Ø PRINT"RATE OF INTEREST :"R"%
"
3ØØ PRINT
31Ø PRINT"NUMBER OF YEARS  :"Y
32Ø PRINT : PRINT : PRINT
33Ø PRINT"MONTHLY PAYMENTS : $"P
34Ø PRINT"INTEREST PAID    : $"L
35Ø PRINT"DEFERRED PRICE   : $"K
355 END
36Ø CLS : PRINT A;"FOR";N;
37Ø PRINT"MO. AT";R;"%"
38Ø PRINT:PRINT">> STAND BY - NO
W COMPUTING"
39Ø SOUND 165,1Ø
4ØØ RETURN
41Ø SOUND 1ØØ,5 : PRINT:PRINT"
NOTE : T O O   L A R G E  !"
42Ø END
```

The Assembly Line

Part VII: Julia's Child

by William P. Nee



Part I of "The Assembly Line" (RAINBOW, May 1990) discussed computing and plotting numbers within the Mandelbrot set. The computations involved the repeated squaring of a complex number *z* and adding another complex number *c* (*new z=z*z+c*). In the Mandelbrot set the complex number always varied (it was the current *x* and *y* coordinates). In the Julia set, named for French mathematician Gaston Julia, *c* is defined at the beginning and remains constant all the way through the computation. This may seem like a small change in procedure, but it causes major differences. All the Julia coordinates can be thought of as pages in a book. The Mandelbrot set is the sum of these infinite pages and is a volume by itself.

Take a look at Listing 1. In Line 90 the real part of the complex number (JA) is added and in Line 100 the imaginary part (JB) is added. If this was a Mandelbrot program, Line 90 would have added *x* instead of JA and Line 100 would have added *y* instead of JB. Julia sets are usually plotted somewhere between -1.5 and +1.5 on both the real *x* axis and imaginary *y* axis. If JA and JB are coordinates within the Mandelbrot set, the resulting Julia set will be connected. But if they are outside the set, there will be isolated sets. You can zoom in on any portion of a Julia set by changing the *x* and *y* locations. The Julia coordinates (JA and JB) remain unchanged.

The machine language program (Listing 3) and it's BASIC driver (Listing 2) will compute either a Mandelbrot or Julia set, save it with all necessary information to disk, zoom in on part of the picture and even recolor any part of it. The first part of Listing 3 assigns space for all the variables, clears the iteration counter array (256 bytes) and the array where the iteration count for each point will be stored ($8000 to $E000).

The coordinates for each point are computed in lines 470-540 and lines 550-640. The imaginary part of the number (2*A*B) is computed in lines 730-780 and the real part (A*A-B*B) is computed in lines 800-950. If it's a Mandelbrot program (JULIA=0) the *x* and *y* locations are added and if it's a Julia program (JULIA=1) then the JA and JB coordinates are added. The real and imaginary parts are squared and added together in lines 1120-1150. If the value is greater than four, the point must be outside the desired set and is colored based on it's iteration count. If the value is less than four and the maximum iteration count hasn't been reached, the whole process is repeated. When the count has been reached, the point is plotted as a Mandelbrot or Julia set point. Every point within the area you've picked is checked and plotted in the same manner.

The next part of the program originates at $7500 and is a cursor routine. Graphics for the cursor are stored in CURSOR. The ROM routine in Location $A00A reads the joystick, stores the horizontal distance in $015A and the vertical distance in $015B. Since these readings are only from zero to 63 and the cursor is one byte wide, I had to scale each before saving them. Also, since the cursor is eight bytes high, the top can't go below 184. The byte where the cursor will

Bill Nee bucked the snowbird trend by retiring to Wisconsin from a banking career in Florida. The success of his 13-part series, "Machine Language Made BASIC" (July 1988 to July 1989), prompted him to continue writing articles on Color Computer machine-language programming. You may contact Bill at Route 2, Box 216C, Mason, WI 54856-9302.

be located is determined (lines 1900-1960), and the eight graphics bytes under it are removed and replaced with the cursor (lines 1990-2080). After a short delay the graphics are replaced (lines 2140-2210). This continues until you press the fire button indicating that this location is the upper-left corner of the zoom box.

As long as you hold down the fire button, the program keeps drawing a box. The horizontal and vertical distance between the old and current location is computed in lines 2300-2370. When this distance is at least three, graphics along the top border are removed and replaced with a red line (lines 2520-2590). The right side is drawn next (lines 2610-2700), the bottom line is drawn (lines 2720-2810) and finally the left side (lines 2830-2920). After a short delay all graphics bytes are replaced in the same order.

This activity repeats until the fire button is released indicating the location of the lower-right corner of the zoom box. The BASIC program then uses this information to compute new coordinates, rescale them and then start drawing. There is a pause before drawing to let you write down the new coordinates and distances. Remember, the zoom box must start at the upper-left corner and go to the lower-right corner. I did not include any error trapping to see if the user tries any other direction.

The final routine (starting at $7A00) recolors the display according to what new color value you assign to a specific iteration count. The program starts in high RAM, searching the stored count array for the one you have chosen (lines 3450-3540). When it finds a match, the coordinates for that point are computed and the point is PSET with the new color you picked (lines 3560-3760). The program keeps searching for other occurrences of the iteration count, setting those coordinates whenever one is found, then returns to BASIC. Each routine is a stand-alone program and could be added to other programs. For example, I use the cursor and recolor routines in several different drawing programs. When you've finished typing the program and correcting errors, save the source code as W MANDEL.SRC and assemble it with A MANDEL.BIN /NS/WE.

Now to review the BASIC program in Listing 2. Since there are many different strings in use, I had to clear a lot of space for them in Line 10. And because each disk file is so large, the FILES command clears space for 310 bytes. Lines 20-30 dimension all of the variables up front, which ensures that the VARPTR command will always produce the correct result. Array CL is a clear block that quickly erases. Array GE will get graphics and array NU gets the current recolor numbers.

The subroutine in Line 1700 originally creates an MJDATA file of 307 bytes, which will contain all the necessary picture information. Once this file exists, the routine prints the names of the pictures. The subroutine at Line 1500 pokes a 252-byte color scheme into the color array at $72C9. You can use any other method of coloring, as long as it ends with POKE C0+251,255.

If you enter your own coordinates, XLOCATION and YLOCATION are the beginning of the area you want to display. XDISTANCE is how far to the right to go and YDISTANCE is

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how far up (both of these must be positive). For Julia sets, also include the Julia point you're looking at ($703A is JULIA in the machine language program). If the coordinates entered are correct, the drawing routine of the machine language program is executed.

The routine at Line 300 gives you menu options. Recoloring should be done before saving the picture and information to disk. Line 400 terminates the entire program. Line 500 copies the current picture to page five and saves the current information, while Line 1100 is the reverse transferring the picture and information back to page one.

Line 600 finishes the cursor routine by computing new *x* and *y* locations. The subroutine at Line 1200 computes the new *x* scale and *y* scale and then pokes all this new information into the machine-language program.

The routine at Line 700 loads the picture you select, opens the corresponding file to get all the necessary information and pokes the color scheme into the color array. Line 900 is the reverse, saving the picture and information to disk. NM$ is the name you want to give the picture, up to 12 letters. I start all names with an M or J to indicate which set they belong to. The program automatically creates a disk title MANDEL 1.PIX, etc. Line 1600 creates a 252 byte string of the current color array so it can be saved to disk.

The recolor routine starting at Line 1800 is almost half of the entire BASIC program. You are given the choice of having the used iteration counts and their colors sent to the screen and printer, or skipping over that part. Line 2200 draws the three-digit count you select and the color you want. Remember to use the back arrow to correct any mistakes. When the count has been recolored, press Enter for another recolor or the up arrow to go back to the menu. Line 2600 saves the DRAW commands for numbers and a dash as strings.

Wow! Let's try an example and get a feel for the program. Save the BASIC program as MANDEL and then run it. At the prompt, press 1 to enter your own data. Then enter -.83 for XLOCATION, +1.66 for XDISTANCE, -.83 for YLOCATION and +1.66 for YDISTANCE. Since this will be a Julia set, enter J and then +.31 for JA LOCATION and +.00742 for JB LOCATION. When the picture is finished, press ENTER to get to the menu and then either 3 or 4 to scale it. Try zooming in on the large spiral on the lower-left side, which should give you a large version of the original. While Mandelbrot set pictures may change considerably when you zoom in, Julia set pictures tend to be enlarged originals.

If you are willing to forgo the recoloring routine, you could really increase the iteration count. The current count would have to be a two-byte number and the color table enlarged. Some displays with very small distances may require up to 1000-1500 iterations to get all the detail. You can stop the program and go to different lines if you've made a mistake that can't be corrected.

The basic menu begins in Line 80 and the menu options begin in Line 300. Line 900 saves the picture and information (be sure S is the current file number).

That's going to be all for Mandelbrot and Julia sets for a while. Maybe at some time in the future we'll draw them in 3-D. In the next article I'll discuss warping and twisting pictures. Your suggestions and comments are appreciated. If you have any ideas for future articles or general questions, please let me know. ❑

64K Disk

Listing 1: MANDEL1

```
0 'COPYRIGHT 1990 FALSOFT, INC.
10 XL=-.83:XD=+1.66:XS=XD/64
20 YL=-.83:YD=+1.66:YS=YD/64
30 JA=+.31:JB=+.00742
40 PMODE1,1:PCLS:SCREEN1,0
50 FOR H=0 TO 63:X=XL+H*XS
60 FOR V=0 TO 63:Y=YL+V*YS
70 A=X:B=Y
80 FOR C=0 TO 50
90 AA=A*A-B*B+JA
100 BB=2*A*B+JB
110 A=AA:B=BB
120 IF A*A+B*B>4 THEN PSET(H+H,1
90-(V+V),C AND 3):GOTO 140
130 NEXT C:PSET(H+H,190-(V+V),4)
140 NEXT V,H
150 GOTO 150
```

```
70 ..... 253
160 ..... 136
340 ..... 92
620 ..... 9
760 ..... 88
900 ..... 200
1010 ..... 70
1210 ..... 87
1320 ..... 10
1510 ..... 152
1705 ..... 101
1820 ..... 112
1950 ..... 64
2040 ..... 123
2130 ..... 165
2280 ..... 24
2390 ..... 198
2500 ..... 123
END ..... 36
```

Listing 2: MANDEL2

```
0 'COPYRIGHT 1990 FALSOFT, INC.
10 CLEAR1000,&H7000-1:PCLEAR8:FI
LES 1,310:CLS
20 IF PEEK(&H7040)<>142 THEN LOA
DM"MANDEL"
30 DIM NM$(20),TI$(20),XL,YL,XD,
YD,XS,YS,JA,JB,V,H,X1,Y1,X2,Y2,L
X,LY,DX,DY,AJ,BJ,X,A,S,B,C,D,J,C
T,NU,CO
40 DIM GE(11),CL(11),NU(11),A$(1
0),A$,B$,C$,D$,DA$,CO$,XL$,XD$,Y
L$,YD$,JA$,JB$
50 GOSUB 1700:J=0
60 PRINT" MANDELBROT/JULIA PROGR
AM":GOSUB1500
70 PMODE3,1:PCLS:GET(0,0)-(55,7)
,CL
80 PRINT"MENU SELECTION -":PRINT
90 PRINT" 1)INPUT CURRENT DATA":
PRINT
100 PRINT" 2)LOAD PICTURE FROM D
ISK":PRINT
110 A$=INKEY$:IF A$=""THEN 110 E
LSE ON VAL(A$) GOTO 120,700
120 CLS:PRINT:INPUT"XLOCATION";X
L
130 INPUT"XDISTANCE";XD:IF XD<=0
 THEN 130
140 PRINT:INPUT"YLOCATION";YL
150 INPUT"YDISTANCE";YD:IF YD<=0
 THEN 150
160 PRINT:PRINT"<M>ANDELBROT OR
<J>ULIA SET"
170 A$=INKEY$:IF A$="M" THEN J=0
:GOTO 210: ELSE IF A$="J" THEN 1
80 ELSE 170
180 IF A$="J" THEN J=1
190 PRINT:INPUT"JA LOCATION";JA
200 INPUT"JB LOCATION";JB
210 POKE &H703A,J:GOSUB1200:PMOD
E3,1:PCLS:SCREEN1,0
220 EXEC &H704A:SOUND 50,4:EXEC
&HADFB
300 CLS:PRINT"OPTIONS -"
310 PRINT" 1)SAVE TO DISK"
320 PRINT" 2)LOAD FROM DISK
330 PRINT" 3)SAVE TO MEMORY AND
SCALE
340 PRINT" 4)SCALE PICTURE
350 PRINT" 5)LOAD FROM MEMORY AN
D SCALE
360 PRINT" 6)RECOLOR",," 7)END P
ROGRAM"
370 A$=INKEY$:IF A$=""THEN 370
380 ON VAL(A$) GOTO 900,700,500,
600,1100,1800,400
390 GOTO370
400 PCLEAR4:CLEAR200,&H7FFF:NEW
500 FOR N=1 TO 4:PCOPY N TO N+4:
NEXT
510 LX=XL:DX=XD:LY=YL:DY=YD:AJ=J
A:BJ=JB
600 PMODE3,1:SCREEN1,0
610 EXEC &H751A
620 H1=PEEK(&H7500)*4:V1=PEEK(&H
7501):V1=192-V1
```

```
630 X1=XL+H1*XS:Y1=YL+V1*YS
640 H2=(PEEK(&H7502)+1)*4:V2=PEE
K(&H7503):V2=191-V2
650 X2=XL+H2*XS:Y2=YL+V2*YS
660 XD=X2-X1:YD=Y1-Y2
670 XL=X1:YL=Y2
680 GOTO 210
700 CLS:PRINT"DISK DIRECTORY -"
710 IF S>0 THEN GOSUB 1750
720 IF S=0 THEN GOSUB 1700
730 PRINT
740 INPUT"ENTER DESIRED TITLE NU
MBER";A:IF A>S THEN 740
750 PMODE3,1:PCLS:SCREEN1,0:POKE
65494,0:LOADM TI$(A)
760 OPEN"D",#1,"MJDATA",307
770 FIELD#1,1 AS J$,12 AS A$,12
AS B$,5 AS XL$,5 AS XD$,5 AS YL$
,5 AS YD$,5 AS JA$,5 AS JB$,252
AS C$
780 GET#1,A
790 J=VAL(J$):POKE&H703A,J
800 NM$=A$:TI$=B$
810 XL=CVN(XL$):XD=CVN(XD$):XS=X
D/128
820 YL=CVN(YL$):YD=CVN(YD$):YS=Y
D/192
825 JA=CVN(JA$):JB=CVN(JB$)
830 CO$=C$
840 CLOSE#1:GOSUB1650:GOTO 610
900 PRINT:LINEINPUT"PICTURE NAME
 - ";NM$:IF LEN(NM$)>12 THEN PRI
NT"TITLE IS TOO LONG":GOTO900
910 S=S+1:TI$="MANDEL"+RIGHT$(ST
R$(S),2)+".PIX"
920 VERIFYON:SAVEM TI$,&HE00,&H2
5FF,&HE00
930 PRINT"GETTING COLORS -"
940 GOSUB 1600
950 OPEN"D",#1,"MJDATA",307
960 FIELD#1,1 AS J$,12 AS A$,12
AS B$,5 AS XL$,5 AS XD$,5 AS YL$
,5 AS YD$,5 AS JA$,5 AS JB$,252
AS C$
970 LSET J$=RIGHT$(STR$(J),1)
980 LSET A$=NM$
990 LSET B$=TI$
1000 LSET XL$=MKN$(XL)
1010 LSET XD$=MKN$(XD)
1020 LSET YL$=MKN$(YL)
1030 LSET YD$=MKN$(YD)
1035 LSET JA$=MKN$(JA)
1036 LSET JB$=MKN$(JB)
1040 LSET C$=CO$
1050 PUT#1,S:CLOSE#1
1060 NM$(S)=NM$:TI$(S)=TI$
1070 GOTO 300
1100 PMODE3,1:SCREEN1,1
1110 FOR N=5 TO 8:PCOPY N TO N-4
:NEXT
1120 XL=LX:XD=DX:YL=LY:YD=DY:JA=
AJ:JB=BJ
1130 GOTO600
1200 XS=XD/128:V=VARPTR(XS)
1210 FOR N=0 TO 4:POKE&H7001+N,P
EEK(V+N):NEXT
1220 YS=YD/192:V=VARPTR(YS)
1230 FOR N=0 TO 4:POKE&H701B+N,P
EEK(V+N):NEXT
1240 V=VARPTR(XL)
1250 FOR N=0 TO 4:POKE&H7006+N,P
EEK(V+N):NEXT
1260 V=VARPTR(YL)
1270 FOR N=0 TO 4:POKE&H7020+N,P
EEK(V+N):NEXT
1280 IF J=0 THEN 1330
1290 V=VARPTR(JA)
1300 FOR N=0 TO 4:POKE&H703B+N,P
EEK(V+N):NEXT
1310 V=VARPTR(JB)
1320 FOR N=0 TO 4:POKE&H7040+N,P
EEK(V+N):NEXT
1330 CLS
1340 PRINT"CURRENT DATA -":PRINT
1350 PRINT" XLOCATION :";XL
1360 PRINT" XDISTANCE :";XD:PRIN
T
1370 PRINT" YLOCATION :";YL
1380 PRINT" YDISTANCE :";YD:PRIN
T:IF J=0 THEN 1410
1390 PRINT" JA LOCATION :";JA
1400 PRINT" JB LOCATION :";JB:PR
INT
1410 PRINT"PRESS ANY KEY TO BEGI
N -"
1420 EXEC &HADFB:RETURN
1500 CO=&H72C9
1510 FOR X=0 TO 10
1520 POKE CO+X,0:NEXT
1530 FOR X=11 TO 250
1540 POKE CO+X,(X AND 3)*&H55
1550 NEXT
1560 POKE CO+251,&HFF:RETURN
1600 CO$="":CO=&H72C9
1610 FOR X=0 TO 251
```


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```
1620 C=PEEK(CO+X)/&H55+1
1630 CO$=CO$+RIGHT$(STR$(C),1)
1640 NEXT:RETURN
1650 CO=&H72C9:FOR X=1 TO 252
1660 C=VAL(MID$(CO$,X,1))
1670 POKE CO+X-1,C
1680 NEXT:RETURN
1700 OPEN"D",#1,"MJDATA",307
1705 IF LOF(1)=0 THEN CLOSE#1:S=
0:RETURN
1710 FIELD#1,1 AS J$,12 AS A$,12
 AS B$,5 AS XL$,5 AS XD$,5 AS YL
$,5 AS YD$,5 AS JA$,5 AS JB$,252
 AS C$
1720 FOR S=1 TO LOF(1):GET #1,S
1730 NM$(S)=A$:TI$(S)=B$
1740 NEXT:CLOSE#1:S=S-1:RETURN
1750 FOR X=1 TO S
1760 PRINTUSING"##>";X;:PRINT NM
$(X),
1770 NEXT:RETURN
1800 'RECOLOR DISPLAY
1810 CLS:PRINT"RECOLOR"
1820 PRINT"1> PRINT TO SCREEN","
2> TO PRINTER",,"3> SKIP TO RECO
LOR"
1830 PRINT:PRINT"WHICH ONE -"
1840 A$=INKEY$:IF A$=""THEN 1840
1850 IF A$="1" THEN 1890
1860 IF A$="2" THEN 2800
1870 IF A$="3" THEN 2110
1880 GOTO 1840
1890 CT=&H719D:CO=&H72C9:DA$="-"
1910 CLS:C=0:FOR X=0 TO 63:IF PE
EK(CT+X)=0 THEN 1950
1920 PRINTUSING"###";X;:PRINTDA$
;
1930 PRINTUSING"# ";PEEK(CO+X)/&
H55+1;
1940 C=C+1:IF C=5 THEN C=0:PRINT
1950 NEXT:PRINT:PRINT"PRESS ANY
KEY TO CONTINUE";:EXEC&HADFB:C=0
1960 CLS:C=0:FOR X=64 TO 127:IF
PEEK(CT+X)=0 THEN 2000
1970 PRINTUSING"###";X;:PRINTDA$
;
1980 PRINTUSING"# ";PEEK(CO+X)/&
H55+1;
1990 C=C+1:IF C=5 THEN C=0:PRINT
2000 NEXT:PRINT:PRINT"PRESS ANY
KEY TO CONTINUE";:EXEC&HADFB:C=0
2010 CLS:C=0:FOR X=128 TO 191:IF
 PEEK(CT+X)=0 THEN 2050
2020 PRINTUSING"###";X;:PRINTDA$
;
2030 PRINTUSING"# ";PEEK(CO+X)/&
H55+1;
2040 C=C+1:IF C=5 THEN C=0:PRINT
2050 NEXT:PRINT:PRINT"PRESS ANY
KEY TO CONTINUE";:EXEC&HADFB:C=0
2060 CLS:C=0:FOR X=192 TO 255:IF
 PEEK(CT+X)=0 THEN 2100
2070 PRINTUSING"###";X;:PRINT DA
$;
2080 PRINTUSING"# ";PEEK(CO+X)/&
H55+1;
2090 C=C+1:IF C=5 THEN C=0:PRINT
2100 NEXT:PRINT
2110 PRINT"ENTER 3-DIGIT COUNT (
000 - 250)"
2120 PRINT"THEN ENTER 1-DIGIT CO
LOR (1 - 4)";
2130 PRINT"PRESS ANY KEY TO BEGI
N";
2140 EXEC &HADFB
2200 PMODE3,1:SCREEN1,0:GOSUB260
0:GET(0,0)-(55,7),GE
2210 POKE 135,0:A$="":B$="":C$="
":D$=""
2220 PUT(0,0)-(55,7),CL,PSET
2230 A$=INKEY$:IF A$=""THEN 2230
2240 IF ASC(A$)<48 OR ASC(A$)>50
 THEN 2230
2250 A=VAL(A$):DRAW"BM1,1;XA$(A)
;"
2260 B$=INKEY$:IF B$=""THEN 2260
2270 IF B$=CHR$(8) THEN DRAW"C1;
BM1,1;XA$(A);C4":GOTO 2230
2280 IF ASC(B$)<48 OR ASC(B$)>58
 THEN 2260
2290 IF A=2 AND ASC(B$)>53 THEN
 2260
2300 B=VAL(B$):DRAW"BM10,1;XA$(B
);"
2310 C$=INKEY$:IF C$=""THEN 2310
2320 IF C$=CHR$(8) THEN DRAW"C1;
BM10,1;XA$(B);C4":GOTO2260
2330 IF ASC(C$)<48 OR ASC(C$)>57
 THEN 2310
2340 C=VAL(C$)
2350 NU=100*A+10*B+C:IF NU>255 T
HEN 2310
2360 DRAW"BM20,1;XA$(C);"
2370 POKE &H7A57,NU
2380 DRAW"BM30,1;XDA$;"
2390 D$=INKEY$:IF D$=""THEN 2390
2400 IF D$=CHR$(8) THEN DRAW"C1;
BM20,1;XA$(C);C4":GOTO 2310
2410 D=VAL(D$):IF D<1 OR D>4 THE
N 2390
2420 DRAW"BM40,1;XA$(D);"
2430 GET(0,0)-(55,7),NU:PUT(0,0)
-(55,7),GE,PSET
2440 POKE &HB5,(D-1)*&H55:POKE C
O+NU,(D-1)*&H55
2450 EXEC &H7A00
2460 PUT(0,0)-(55,7),NU,PSET
2470 A$=INKEY$:IF A$=""THEN 2470
2480 IF A$=CHR$(94) THEN PUT(0,0
)-(55,7),GE,PSET:GOTO 300
2490 IF A$=CHR$(13) THEN 2210
2500 GOTO 2470
2600 A$(0)="R6D6L6U5"
2610 A$(1)="BR3NG3D6NL3R3"
2620 A$(2)="R6D3L6D3R6"
2630 A$(3)="R6D3NL4D3L6"
2640 A$(4)="D3R6NU3D3"
2650 A$(5)="NR6D3R6D3L6"
2660 A$(6)="D6R6U3L6"
2670 A$(7)="R6D6"
2680 A$(8)="NR6D3NR6D3R6U6"
2690 A$(9)="ND3R6D3NL6D3"
2700 DA$="BD3BR1R3":RETURN
2800 CO=&H72C9:CT=&H719D:DA$="-"
2810 C=0:FOR X=0 TO 252:IF PEEK(
CT+X)=0 THEN 2850
2820 PRINT#-2,USING"###";X;:PRIN
T#-2,DA$;
2830 PRINT#-2,USING"# ";PEEK(CO+
X)/&H55+1;
2840 C=C+1:IF C=13 THEN C=0:PRIN
T#-2
2850 NEXT:GOTO 2110
```

Listing 3: MANDEL.ASM

```
00100          ORG     $7000
00110 HORZ     RMB     1
00120 XSCALE   RMB     5
00130 XLOC     RMB     5
00140 ACOR     RMB     5
00150 AA       RMB     5
00160 ASQR     RMB     5
00170 VERT     RMB     1
00180 YSCALE   RMB     5
00190 YLOC     RMB     5
00200 BCOR     RMB     5
00210 BB       RMB     5
00220 BSQR     RMB     5
00230 COUNT    RMB     1
00240 TEMPB    RMB     5
00250 JULIA    RMB     1
00260 JA       RMB     5
00270 JB       RMB     5
00280 FOUR     FDB     $8300   VARPTR(4)
00290          FDB     $0000
00300          FCB     $00
00310
00320 START    LDX     #ITCT   CLEAR IT OUT
00330          LDD     #0
00340 CLOOP    STD     ,X++
00350          CMPX    #ITCT+256
00360          BLO     CLOOP
00370          ORCC    #$50
00380          LDY     #$8000  IN HIGH RAM
00390          CLR     $FFDF   HIGH RAM
00400 CL1      STD     ,Y++    CLEAR IT OUT
00410          CMPY    #$E000
00420          BLO     CL1
00430          CLR     $FFDE   LOW RAM
00440          LDY     #$8000
00450
00460 SHOW     CLRB
00470 LOOP3    STB     HORZ
00480          JSR     $BC7C
00490          LDX     #XSCALE
00500          JSR     $BACA
00510          LDX     #XLOC
00520          JSR     $B9C2
00530          LDX     #ACOR   =XL+H*XS
```

```
00540          JSR     $BC35
00550          CLRB
00560 LOOP2    STB     VERT
00570          CLRA
00580          JSR     $B4F4
00590          LDX     #YSCALE
00600          JSR     $BACA
00610          LDX     #YLOC
00620          JSR     $B9C2
00630          LDX     #BCOR    =YL+V*YS
00640          JSR     $BC35
00650          LDX     #BB
00660          JSR     $BC35
00670          LDX     #ACOR
00680          JSR     $BC14
00690          LDX     #AA
00700          JSR     $BC35
00710          CLRB
00720 LOOP1    STB     COUNT
00730          LDX     #AA
00740          JSR     $BC14
00750          LDX     #BB
00760          JSR     $BACA    =A*B
00770          INC     $4F      =2*A*B
00780          LDX     #TEMPB
00790          JSR     $BC35
00800          LDX     #AA
00810          JSR     $BC14
00820          LDX     #AA
00830          JSR     $BACA    =A*A
00840          LDX     #ASQR
00850          JSR     $BC35
00860          LDX     #BB
00870          JSR     $BC14
00880          LDX     #BB
00890          JSR     $BACA    =B*B
00900          LDX     #BSQR
00910          JSR     $BC35
00920          LDX     #BSQR
00930          JSR     $BC14
00940          LDX     #ASQR
00950          JSR     $B9B9    =A*A-B*B
00960          LDX     #ACOR
00970          TST     JULIA    IS IT A JULIA PROGRAM?
00980          BEQ     JA1        NO
00990          LDX     #JA        YES
01000 JA1      JSR     $B9C2
01010          LDX     #AA      =NEW REAL NUMBER
01020          JSR     $BC35
01030          LDX     #TEMPB
01040          JSR     $BC14
01050          LDX     #BCOR
01060          TST     JULIA
01070          BEQ     JB1
01080          LDX     #JB
01090 JB1      JSR     $B9C2
01100          LDX     #BB      =NEW IMAGINARY NUMBER
01110          JSR     $BC35
01120 TEST2    LDX     #ASQR
01130          JSR     $BC14
01140          LDX     #BSQR
01150          JSR     $B9C2    =A*A+B*B
01160          LDX     #FOUR
01170          JSR     $BC96    GREATER THAN 4?
01180          TSTB
01190          BPL     COLOR2     YES
01200          LDB     COUNT
01210          INCB
01220          CMPB    #250
01230          LBLS    LOOP1
01240 COLOR1   STB     COUNT
01250 COLOR2   LDB     COUNT
01260          CLR     $FFDF
01270          STB     ,Y+        SAVE ITERATION COUNT
01280          CLR     $FFDE
01290          CLRA
```


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```
01300           LDX     #ITCT
01310           STB     D,X       SHOW IT'S BEEN USED
01320           LDX     #CTABLE
01330           LDB     D,X       GET COLOR FOR COUNT
01340 PSET      STB     $B5
01350           LDA     #191
01360           SUBA    VERT
01370           LDB     #32
01380           MUL
01390           ADDA    $BA
01400           TFR     D,X
01410           LDB     HORZ
01420           LSRB
01430           LSRB
01440           ABX
01450           LDA     HORZ
01460           ANDA    #3
01470           LDU     #$92E5
01480           LDA     A,U
01490           ANDA    $B5
01500           ORA     ,X
01510           STA     ,X
01520 NEXT      LDB     VERT
01530           INCB
01540           CMPB    #191
01550           LBLS    LOOP2
01560           LDB     HORZ
01570           INCB
01580           CMPB    #127
01590           LBLS    LOOP3
01600           ANDCC   #$AF
01610           RTS
01620 ITCT      RMB     300
01630 CTABLE    RMB     300
01640
01650           ORG     $7500
01660 HORIZ1    RMB     1
01670 VERT1     RMB     1
01680 HORIZ2    RMB     1
01690 VERT2     RMB     1
01700 BYTE1     RMB     2
01710 BYTE2     RMB     2
01720 ACROSS    RMB     1
01730 DOWN      RMB     1
01740 CARRAY    RMB     8
01750 CURSOR    FDB     $FCF0
01760           FDB     $F0F0
01770           FDB     $0CCCC
01780           FDB     $0303
01790 JOY1      JSR     [$A00A]
01800           LDA     $15A      X DIRECTION
01810           LSRA
01820           STA     HORIZ1
01830           LDB     $15B      Y DIRECTION
01840           PSHS    B
01850           LSLB
01860           ADDB    ,S+
01870         CMPB    #184      STAY 8 BYTES FROM BOTTOM
01880           BLS     UL
01890           LDB     #184
01900 UL        STB     VERT1
01910           LDA     #32
01920           MUL
01930           ADDB    HORIZ1
01940           ADCA    #0
01950           ADDA    $BA
01960           STD     BYTE1     CURSOR BYTE
01970           TFR     D,U
01980
01990           LDX     #CARRAY
02000           LDY     #CURSOR
02010           LDB     #8
02020 CLOOP1    LDA     ,U
02030           STA     ,X+       SAVE GRAPHICS
02040           LDA     ,Y+       REPLACE WITH CURSOR
02050           STA     ,U
02060           LEAU    32,U      DOWN 1 BYTE
02070           DECB
02080           BNE     CLOOP1
02090
02100 DELAY1    LDX     #$2000
02110 DLAY1     LEAX    -1,X
02120           BNE     DLAY1
02130
02140           LDU     BYTE1     REPLACE GRAPHICS
02150           LDX     #CARRAY
02160           LDB     #8
02170 CLOOP2    LDA     ,X+
02180           STA     ,U
02190           LEAU    32,U
02200           DECB
02210           BNE     CLOOP2
02220
02230 FBUTT     LDA     $FF00     F/B PUSHED?
02240           CMPA    #255
02250           BEQ     JOY1
02260           CMPA    #127
02270           BEQ     JOY1
02280
02290 JOY2      JSR     [$A00A]   YES
02300           LDA     $15A      NEW X LOCATION
02310           LSRA
02320           STA     HORIZ2
02330           LDB     $15B      NEW Y LOCATION
02340           PSHS    B
02350           LSLB
02360           ADDB    ,S+
02370 LR        STB     VERT2
02380
02390 GET       LDA     HORIZ2
02400           SUBA    HORIZ1
02410           CMPA    #3        AT LEAST 3 BYTES LONG
02420           BLO     JOY2
02430           STA     ACROSS
02440           LDB     VERT2
02450           SUBB    VERT1
02460           CMPB    #3
02470           BLO     JOY2
02480           STB     DOWN
02490           LDU     BYTE1
02500           LDX     #ARRAY2
02510
02520           LDB     ACROSS    TOP BORDER
02530           INCB
02540 GETL1     LDA     ,U        GET GRAPHICS
02550           STA     ,X+
02560           LDA     #255
02570           STA     ,U+       REPLACE WITH RED
02580           DECB
02590           BNE     GETL1
02600
02610           LEAU    -1,U      RIGHT SIDE
02620           LDB     DOWN
02630           DECB
02640 GETL2     LEAU    32,U
02650           LDA     ,U
02660           STA     ,X+
02670           ORA     #3        JUST RIGHT SIDE RED
02680           STA     ,U
02690           DECB
02700           BNE     GETL2
02710
02720           LEAU    32,U      BOTTOM BORDER
02730           LDB     ACROSS
02740           INCB
02750 GETL3     LDA     ,U
02760           STA     ,X+
02770           LDA     #255
02780           STA     ,U
02790           LEAU    -1,U
02800           DECB
02810           BNE     GETL3
```

```
02820
02830          LEAU    1,U       LEFT SIDE
02840          LDB     DOWN
02850          DECB
02860 GETL4    LEAU    -32,U
02870          LDA     ,U
02880          STA     ,X+
02890          ORA     #$C0      JUST LEFT SIDE RED
02900          STA     ,U
02910          DECB
02920          BNE     GETL4
02930
02940 DELAY2   LDX     #$2000
02950 DLAY2    LEAX    -1,X
02960          BNE     DLAY2
02970          LDU     BYTE1
02980          LDX     #ARRAY2
02990
03000 PUT      LDB     ACROSS    REPLACE GRAPHICS
03010          INCB
03020 PUTL1    LDA     ,X+
03030          STA     ,U+
03040          DECB
03050          BNE     PUTL1
03060
03070          LEAU    -1,U
03080          LDB     DOWN
03090          DECB
03100 PUTL2    LEAU    32,U
03110          LDA     ,X+
03120          STA     ,U
03130          DECB
03140          BNE     PUTL2
03150
03160          LEAU    32,U
03170          LDB     ACROSS
03180          INCB
03190 PUTL3    LDA     ,X+
03200          STA     ,U
03210          LEAU    -1,U
03220          DECB
03230          BNE     PUTL3
03240
03250          LEAU    1,U
03260          LDB     DOWN
03270          DECB
03280 PUTL4    LEAU    -32,U
03290          LDA     ,X+
03300          STA     ,U
03310          DECB
03320          BNE     PUTL4
03330
03340          LDA     $FF00     RELEASED F/B?
03350          CMPA    #254
03360          LBEQ    JOY2
03370          CMPA    #126
03380          LBEQ    JOY2
03390
03400 DONE     JSR     [$A000]   YES
03410          BEQ     DONE
03420          RTS
03430 ARRAY2   RMB     1
03440
03450          ORG     $7A00
03460 RECOL    LDY     #$8000    IN HIGH RAM
03470          ORCC    #$50
03480          CLR     $FFDF     HIGH RAM
03490          CLRB
03500 REL1     STB     HORZ
03510          CLRA
03520 REL2     STA     VERT
03530          LDA     ,Y+       GET NEXT COUNT
03540          CMPA    NUMBER    IS IT ONE WE WANT?
03550          BNE     CONT       NO
03560          LDA     #191       YES
03570          SUBA    VERT
03580          LDB     #32
03590          MUL
03600          ADDA    $BA
03610          TFR     D,X
03620          LDB     HORZ
03630          LSRB
03640          LSRB
03650          ABX
03660          LDA     HORZ
03670          ANDA    #3
03680          LDU     #PTABLE
03690          LDA     A,U
03700          TFR     A,B
03710          COMA
03720          ANDA    ,X
03730          ANDB    $B5       NEW COLOR
03740          PSHS    B
03750          ORA     ,S+
03760          STA     ,X
03770 CONT     LDA     VERT
03780          INCA
03790          CMPA    #191
03800          BLS     REL2
03810          LDB     HORZ
03820          INCB
03830          CMPB    #127
03840          BLS     REL1
03850          CLR     $FFDE     LOW RAM
03860          ANDCC   #$AF
03870          RTS
03880 NUMBER   RMB     1
03890 PTABLE   FDB     $C030
03900          FDB     $0C03
03910
03920          END     START
```

CORRECTIONS

"Turn of the Screw" (August 1990, Page 48): The pin number for E on the CoCo bus in Table 2 is incorrect. E appears on the CoCo bus on Pin 6, not Pin 16 as shown in the table. Also, the *RST pin should be listed in Table 2 on Pin 1 of the MEB bus and Pin 5 of the CoCo bus. The corrected table is shown below:

Pin Name	MEB Pin#	CoCo Pin#
D0	5	10
D1	6	11
D2	7	12
D3	8	13
D4	9	14
D5	10	15
D6	11	16
D7	12	17
A0	3	19
A1	4	20
A2	17	21
R/*W	15	18
E	2	6
*CE	13	36
*RST	1	5
+5V	16	9
GND	14	33

Table 2: System Pinouts

Novices Niche

Bank Account

by William W. Coolman

This is a simple program to balance your checkbook in the manner suggested on the back of most bank statements. The program gives you a choice of running it on any Color Computer. If you are using a CoCo 1 or 2, the screen appears as usual. If you have a CoCo 3, the screen changes to a black background and you see true lowercase on the screen.

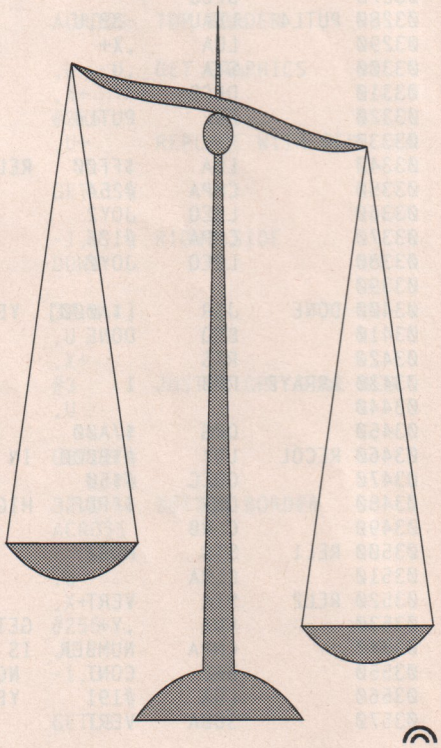
It seems as if everyone has a bank program, but most do not give you a choice of black or green screen with true lowercase. These additions are noteworthy and I encourage you to experiment with them in your own programs.

Use *Bank* to balance your check register. Then if your book does not agree with CoCo, print it on any printer. I use a DMP-110, but the program should work with most any other printer.

If you choose CoCo 3, you'll need to press the Reset button and re-run the program to get back to the Choice menu and wash the black off the screen.

The Listing: BANK

```
1 'BANK ACCOUNT
2 'WRITTEN BY WILLIAM W. COOLMAN
3 'COPYRIGHT FEBRUARY 1991
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 PRINT
20 PRINT"         ///////
30 PRINT"         BANKING
40 PRINT"         ///////
50 PRINT:PRINT"NAME THE COMPUTER
 YOU ARE USEING"
60 PRINT:PRINT"   1-COCO 1 OR 2
70 PRINT:PRINT"   2-COCO 3
80 PRINT
90 INPUT"      TYPE A NUMBER";U
100 ON U GOSUB 140,930
110 PRINT
120 PRINT
130 REM...MARK/BBB,A
140 PRINT"       BANKING
150 PRINT"       ////////
160 PRINT
170 PRINT:PRINT"1-BALANCE CHECK
BOOK"
180 PRINT:PRINT"2-PRINT OUT REGI
STER"
190 PRINT
200 INPUT"     TYPE A NUMBER";H
210 ON H GOTO 220,660
220 CLS 3
230 INPUT"BALANCE";B
240 CLS 3
250 PRINT
260 PRINTTAB(15)"total="B
270 PRINT
280 PRINT:PRINT"  1=checks"
290 PRINT:PRINT"  2=deposits"
300 PRINT:PRINT"  3=checks out"
310 PRINT:PRINT"  4=bank stateme
nt"
320 PRINT:PRINT"    USE zero BAC
K TO MENU"
330 PRINT
340 INPUT"      TYPE A NUMBER";N
350 ON N GOTO 390,450,500,550
360 PRINT
370 PRINT TAB(15)"total="B
380 PRINT
390 INPUT"CHECK=";A
400 B=B-A
410 IF A=0 GOTO 240
420 PRINTTAB(15)"total="B
430 GOTO 390
440 PRINT
450 INPUT"DEPOSIT=";C
460 IF C=0 GOTO 240
470 B=B+C
480 PRINT TAB(15)"total="B
490 GOTO 450
500 INPUT"CHECKS OUT=";K
510 IF K=0 GOTO 240
520 L=L+K
530 PRINT TAB(15)L
540 GOTO 500
550 INPUT"STATEMENT=";M
560 IF M=0 GOTO 240
570 R=M-L
580 PRINT"CHECKS OUT"TAB(12)L
590 PRINT"BANK BOOK"TAB(11)R
600 IF R=M-L THEN PRINT TAB(15)"
correct"
610 PRINT
620 PRINT
630 INPUT"hit <enter> back to me
nu";Y
640 IF Y=0 THEN GOTO 240
650 PRINT
660 INPUT"MONTH";D$
670 INPUT"YEAR";F
680 PRINT#-2,"DATE "D$;F
690 INPUT"BALANCE";B
700 PRINT#-2,"LAST MONTH'S BALAN
CE----------------";B
710 PRINT#-2,"CHECKS
            TOTAL"
720 PRINT"USE ZERO TO CHANGE"
730 PRINT
740 PRINT TAB(15)"TOTAL"
750 PRINT"CHECKS"
760 PRINT
770 INPUT"CHECK=";A
780 PRINT#-2,"              CHECK"
;A
790 B=B-A
800 IF A=0 GOSUB 840
810 PRINTTAB(15)B
820 PRINT#-2,"BALANCE--------";
B
830 GOTO 770
840 PRINT
850 INPUT"DEPOSIT=";C
860 PRINT#-2,"              DEPOSI
T";C
870 IF C=0 GOTO 770
880 B=B+C
890 PRINT TAB(15)B
900 PRINT#-2,"
    =";B
910 GOTO 850
920 PRINT
930 POKE&H95C9,&H7F:POKE&HFF33,&
H10
940 REM black screen-green type
950 SCREEN 1,0
960 GOTO 140
970 REM...PROG...BANK
```



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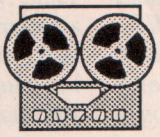

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GR8 - 22 .Bin Pictures
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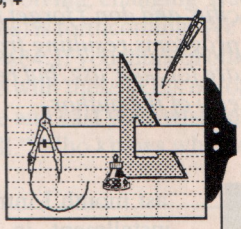
GR12 - Coco Max 3 Pictures
GR13 - Macpaint Graphic Editor
GR14 - 5 Macintosh Pictures



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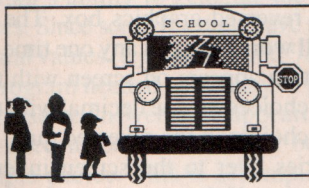

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GA7 - Chess, City, Life, StarTrek, +
GA8 - Chute, Germ, Hurkle, Lunar, +
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GA10 - Cave, HiLow, Scramble, Word Hunt, +
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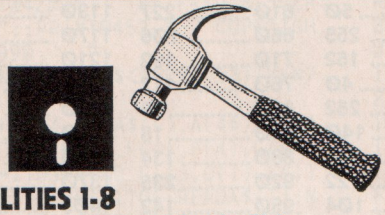

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	GR8	H3	U8	GA8
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	GR11			GA11
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Visualizing Fractions 3

by Fred B. Scerbo
Contributing Editor

If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. *Remember, keep your ideas specific, and don't forget this is* BASIC. *All programs resulting from your wishes are for your use, but remain the property of the author.*

Last month I introduced the latest installment in our educational series on math skills titled *Visualizing Fractions 2*. VISFRAC2 is very different from some of our recent math offerings since it introduces the relationships between different fractions. The graphics in that program are also very different in that they combine several drawing strings with the PAINT command to give a dramatic demonstration of the pie-chart representation of fractions.

This month we'll look at VISFRAC3, a program to help students become more familiar with the decimal versions of all the fractions with denominators between 2 and 9. By using the oppposites shell, users can now easily review all of these relationships and then quiz their recall in two different ways.

Changes

Before it could be used in this program, the opposites shell had to undergo some major changes. Those of you familiar with that screen format will recall that it allows "sets" to be quizzed while showing three choices on the screen with one box (in the upper-left corner of the screen) showing the item to match in reverse graphics. This may have been suitable for other uses, but the reverse-graphics box does not serve our purposes here. Each fraction is usually represented with the black sections indicating which part of the fraction is the numerator. Therefore, in the fraction $^2/_3$, two segments would be black and one segment would be white. But if we print this graphic in reverse, the user might incorrectly think the fraction shown is $^1/_3$ instead of $^2/_3$ since the black and white would be reversed.

This problem was solved by changing the upper-left box to a white box rather than a black, reversed-graphics box. The program still works since at any one time only one fraction appears on screen with three decimal choices, or one decimal with three fraction choices in the reversed quiz. This still carries over to the screen inversion which occurs if the user gives the wrong response. The inverted screen has been

Fred Scerbo is a special needs instructor for the North Adams Public Schools in North Adams, Massachusetts. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.

32K Extended

```
25 ..... 8Ø     565 ..... 81     1Ø9Ø ..... 14
55 ..... 5Ø     61Ø ..... 227    113Ø ..... 33
85 ..... 255    66Ø ..... 1Ø6    117Ø ..... 117
125 ..... 152   71Ø ..... 192    121Ø ..... 62
15Ø ..... 4Ø    76Ø ..... 117    1245 ..... 127
2Ø5 ..... 252   8Ø5 ..... 98     128Ø ..... 1Ø3
255 ..... 14Ø   84Ø ..... 18     131Ø ..... 1Ø3
3Ø5 ..... 221   88Ø ..... 134    134Ø ..... 168
355 ..... 22    92Ø ..... 235    137Ø ..... 181
4Ø5 ..... 1Ø4   95Ø ..... 142    14Ø5 ..... 4Ø
445 ..... 61    985 ..... 67     145Ø ..... 254
48Ø ..... 2Ø7   1Ø2Ø ..... 41   15Ø5 ..... 199
515 ..... 41    1Ø5Ø ..... 226  END ..... 9
```

The Listing: VISFRAC3

```
1 REM**************************
2 REM* VISUALIZING FRACTIONS 3 *
3 REM*   COPYRIGHT (C) 199Ø    *
4 REM*    BY FRED B. SCERBO    *
5 REM*     6Ø HARDING AVE      *
6 REM*  NORTH ADAMS, MA Ø1247  *
7 REM**************************
1Ø CLEAR8ØØ
15 CLSØ:PRINTSTRING$(32,172);STR
ING$(32,2Ø4);:FORI=1TO 224 :READ
 A:PRINTCHR$(A+16Ø);:NEXT
2Ø DATA29,28,28,26,3Ø,28,29,21,2
8,29,21,28,29,21,28,3Ø,29,2Ø,3Ø,
21,28,29,2Ø,3Ø,18,29,24,3Ø,29,84
,92,93
25 DATA21,,,24,26,,21,21,,21,21,
,2Ø,2Ø,,26,2Ø,,26,21,,21,,26,26,
21,,26,,,,85
3Ø DATA21,,,18,26,,21,21,16,21,2
1,,,,,26,,,26,21,,21,,26,21,21,,
26,,,,85
35 DATA21,28,28,26,3Ø,29,28,21,2
8,29,21,,,,,26,,,26,21,,21,,26,2
Ø,23,,28,29,,92,93
4Ø DATA21,,,,26,21,,21,,21,21,,,
,,26,,,26,21,,21,,26,,31,,,21,,,
85
45 DATA21,,,,26,2Ø,26,21,,21,21,
```

corrected so that the flashing screen effect still occurs without destroying the flow of the program.

Another major change was also needed for this program to operate properly. Since using Option C (Reverse quiz) requires having more than one fraction-pie chart drawn, the program needed a number of IF...THEN statements to compensate for these changes. Therefore, the program can now tell the difference between the types of graphics it must draw, and it draws a pie chart only when needed.

The third and final change comes in the program's ability to generate the random choices. Since some fractions have the same decimal values (e.g. both 1/2 and 2/4 are 0.5), the program needed some way of preventing the same answer from appearing more than once in one of the three boxes for multiple choice. This is accomplished by comparing the actual values as the numbers are picked. This prevents any duplication and the problems that might result from it.

Using the Program

When using VISFRAC3, you can go to the menu by pressing ENTER after the title card. Selection A, Review Fractions, allows you to go through all choices and their matches by simply pressing ENTER. Options B and C are the same quiz with the order changed. Selection B matches three decimals to one fraction while C lets you match three fractions to one decimal.

The choice you must match with is in the upper-left corner. The remaining three boxes are your choices. You need only press the space bar to move the cursor to your choice. Pressing ENTER records your choice. A correct choice causes the program to show the match, from which you may advance by again pressing ENTER. An incorrect choice causes the screen to flash, and the program lets you try again.

Pressing @ shows your score. You may resume where you left off by pressing C to continue. If you press C after the quiz is over, the program simply restarts.

That's all it takes to use VISFRAC3. You will find it is very useful when learning decimal values, and it generates a better understanding of fractions in general.

Conclusion

At least one more variation on these fraction skills (involving changing fractions to percentages) is forthcoming. We'll call that one VISFRAC4. If you think of other tangents to pursue with these skills or topics, drop me a line and cast your wish into the "Wishing Well." Who knows what we might discover? ❑

```
,21,,,26,,,26,21,,21,,26,,21,,18
,21,,,85
50 DATA28,24,,20,28,,28,20,,20,2
0,28,28,,20,28,,20,28,20,28,28,2
0,28,,28,24,28,28,84,92,92
55 PRINTSTRING$(32,195);STRING$(
32,163);
60 PRINT@388," VISUALIZING FRACT
IONS 3 ";
65 PRINT@420,"    BY FRED B.SCER
BO     ";:PRINT@452,"   COPYRIGH
T (C) 1990    ";
70 X$=INKEY$:IFX$<>CHR$(13)THEN7
0
75 DIM P$(44,4),A$(6),A(44),N(44
),B(4),C(4),D(4),E(4),F(4),G(44)
80 FORI=1TO3:READ C(I),D(I),E(I)
,F(I):NEXT:FORI=1TO6:READA$(I):N
EXT:FORI=1TO44:READP$(I,1),P$(I,
2),P$(I,3):NEXT:FORI=1TO44:READG
(I):P$(I,4)="BR":NEXT
85 COLOR1,0:FORI=1TO9:P$(I,1)=O$
+P$(I,1):NEXTI
90 REM TITLE
95 CLS:PRINTSTRING$(64,"=");:PRI
NT@68,"VISUALIZING FRACTIONS 3":
PRINTSTRING$(64,"=");:PRINT@198,
"A) REVIEW FRACTIONS":PRINT@262,
"B) QUIZ GRAPHICS":PRINT@326,"C)
 REVERSE QUIZ"
100 PRINT@388,"<<<SELECT YOUR CH
OICE>>>"
105 PRINT:PRINTSTRING$(32,"=");
110 X$=INKEY$:X=RND(-TIMER):IFX$
="A"THEN505ELSEIFX$="B"THEN115EL
SEIFX$="C"THEN1510ELSE110
115 CLS0:PMODE0,1:PCLS1
120 LINE(0,0)-(254,170),PRESET,B
125 LINE(6,4)-(122,82),PRESET,B
130 LINE(128,4)-(248,82),PRESET,
B
135 LINE(6,86)-(122,164),PRESET,
B
140 LINE(128,86)-(248,164),PRESE
T,B
145 DRAW"BM26,188C0NU10R10NU10BR
6R10U6L10U4R10BR6NR10D4NR10D6R10
BR12BU6NE4D2F4BR6R10U6L10U4R10BR
6ND10R10D4NL10BR6NR10D6U10R10D10
BR6NR10U10R10BR6NR10D4NR10D6R10B
R10U10NL4R10D4NL10D6NL14BR6U10R1
0D4NL10D6BR6U10R10D4L10R4F6BR6E4
U2H4"
150 DATA130,6,246,80,6,86,120,16
2,130,86,246,162
155 PAINT(2,2),0,0:PCOPY1TO3
160 PMODE0,4:PCLS1
165 LINE(0,0)-(254,170),PRESET,B
F
170 LINE(6,4)-(122,82),PSET,B
175 LINE(128,4)-(248,82),PSET,B
180 LINE(6,86)-(122,164),PSET,B
185 LINE(128,86)-(248,164),PSET,
B
190 PCOPY4TO2:PMODE0,1:SCREEN1,1
195 DATA"BM2,8C0S4","BM130,8C0S4
","BM2,90C0S4","BM130,90C0S4","B
M2,48C0S4","BM130,48C0S4"
200 FORI=1TO44
205 A(I)=RND(44):IFN(A(I))=1THEN
205
210 N(A(I))=1:NEXTI:FORY=1TO44:C
OLOR1,0
215 FORI=2TO4
220 B(I)=RND(3)+1:IFN(B(I))=0THE
N220
225 N(B(I))=0:NEXTI:FORI=1TO4:N(
I)=1:NEXT
230 B=RND(44):IFB=A(Y)THEN230
235 IFG(B)=G(A(Y))THEN230
240 C=RND(44):IFC=B OR C=A((Y))T
HEN240
245 IFG(C)=G(A(Y))THEN240
250 DRAW A$(1):DRAWP$(A(Y),1):IF
 NG=1THEN265
255 CIRCLE(60,42),34,0,.9:PAINT(
56,20),0,0
260 DRAW A$(1):DRAW"C1":DRAWP$(A
(Y),2)
265 DRAW A$(B(2)):DRAWP$(B,3)
270 DRAW A$(B(3)):DRAWP$(C,3)
275 DRAW A$(B(4)):DRAWP$(A(Y),3)
280 IF NG=0THEN315
285 CIRCLE(188,42),34,0,.9:PAINT
(184,36),0,0
290 CIRCLE(60,124),34,0,.9:PAINT
(56,120),0,0
295 CIRCLE(188,124),34,0,.9:PAIN
T(184,120),0,0
300 DRAW A$(B(3))+"C1":DRAWP$(C,
4)
305 DRAW A$(B(4))+"C1":DRAWP$(A(
Y),4)
310 DRAW A$(B(2))+"C1":DRAWP$(B,
4)
315 COLOR1,0
320 Z=0
325 PMODE0,4
330 DRAW A$(1)+"C1":DRAWP$(A(Y),
1):IF NG=1THEN345
335 CIRCLE(60,42),34,1,.9:PAINT(
56,20),1,1
340 DRAW A$(1):DRAW"C0":DRAWP$(A
(Y),2)
345 DRAW A$(B(2))+"C1":DRAWP$(B,
3)
350 DRAW A$(B(3))+"C1":DRAWP$(C,
3)
355 DRAW A$(B(4))+"C1":DRAWP$(A(
Y),3)
360 IF NG=0THEN395
365 DRAW A$(B(2))+"C1":DRAWP$(B,
4)
```

Submitting Material To Rainbow

Contributions to THE RAINBOW are welcome from everyone. We like to run a variety of programs that are useful, helpful and fun for other CoCo owners.

WHAT TO WRITE: We are interested in what you want to tell our readers. We accept for consideration anything that is well-written and has a practical application for the Tandy Color Computer. If it interests you, it will probably interest lots of others. However, we vastly prefer articles with accompanying programs that can be entered and run. The more unique the idea, the more the appeal. We have a continuing need for short articles with short listings. These are especially appealing to our many beginners.

FORMAT: Program submissions must be on tape or disk, and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs and debug our typing errors. All programs should be supported by some editorial commentary explaining how the program works. We also prefer that editorial copy be included in ASCII format on the tape or disk, using any of the word processors currently available for the Color Computer. Also, please include a double-spaced printout of your editorial material and program listing. Do not send text in all capital letters; use upper- and lowercase.

COMPENSATION: We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those wanting more detailed information on making submissions, please send a self-addressed, stamped envelope (SASE) to: Submission Guidelines, THE RAINBOW, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. We will send you comprehensive guidelines.

Please do not submit material currently submitted to another publication.

```
370 DRAW A$(B(3))+"C1":DRAWP$(C,
4)
375 DRAW A$(B(4))+"C1":DRAWP$(A(
Y),4)
380 CIRCLE(188,42),34,1,.9:PAINT
(184,34),1,1
385 CIRCLE(60,124),34,1,.9:PAINT
(56,116),1,1
390 CIRCLE(188,124),34,1,.9:PAIN
T(184,116),1,1
395 PMODE0,1:SCREEN1,1
400 LINE(8,6)-(120,80),PSET,B
405 IF Y>44THEN RUN
410 X$=INKEY$:IFX$=" "THEN420ELS
EIFX$="@"THEN1445
415 COLOR1,0:LINE(8,6)-(120,80),
PRESET,B:GOTO400
420 Z=Z+1:IFZ=4THENZ=1
425 COLOR1,0:LINE(C(Z),D(Z))-(E(
Z),F(Z)),PSET,B
430 X$=INKEY$:IFX$=" "THEN420ELS
EIFX$=CHR$(13)THEN440ELSEIFX$="@
"THEN1445
435 COLOR1,0:LINE(C(Z),D(Z))-(E(
Z),F(Z)),PRESET,B:GOTO425
440 IFZ+1=B(4)THEN450
445 NW=NW+1:FORK=1TO5:PMODE0,4:S
CREEN1,1:SOUND10,3:PMODE0,1:SCRE
EN1,1:SOUND1,3:NEXTK:GOTO425
450 NC=NC+1:PMODE0,4:PCLS1:LINE(
0,40)-(256,126),PRESET,B:LINE(6,
44)-(124,122),PRESET,B:LINE(130,
44)-(248,122),PRESET,B:PAINT(2,4
2),0,0
455 DRAW A$(5)+"S4":DRAWP$(A(Y),
1):IFNG=1THEN465
460 CIRCLE(60,82),34,0,.9:PAINT(
54,60),0,0
465 DRAWA$(5)+"C1":DRAWP$(A(Y),2
)
470 DRAW A$(6):DRAWP$(A(Y),3):IF
NG=0THEN480
475 CIRCLE(188,82),34,0,.9:PAINT
(170,80),0,0
480 DRAWA$(6)+"C1":DRAWP$(A(Y),4
)
485 SCREEN1,1
490 X$=INKEY$:IFX$<>CHR$(13)THEN
490
495 PMODE0,1
500 PCOPY3TO1:SCREEN1,1:PCOPY2TO
4:NEXTY:GOTO1445
505 PMODE0,2:PCLS1:SCREEN1,1:LIN
E(0,40)-(256,126),PRESET,B:LINE(
6,44)-(124,122),PRESET,B:LINE(13
0,44)-(248,122),PRESET,B:PAINT(2
,42),0,0
510 FORI=1TO44:DRAW A$(5)+"S4":C
IRCLE(60,82),34,0,.9:DRAWP$(I,1)
:PAINT(54,60),0,0:DRAWA$(5)+"C1"
:DRAWP$(I,2)
515 DRAWA$(6)+"C0":DRAWP$(I,3):D
RAWA$(6):DRAWP$(I,4)
520 X$=INKEY$:IFX$<>CHR$(13)THEN
520
525 COLOR1,0:LINE(8,46)-(122,120
),PSET,BF:LINE(132,46)-(246,120)
,PSET,BF:NEXTI
530 RUN
535 REM ONE HALF
540 DATA"BR58BD34NU28ND28BR44BD1
2NR8U4R8U4L8BU4L2R12L6BU4U8"
545 DATA
550 DATA"BR34BD46S8R8U12L8D12BR1
2RBR4R8U6L8U6R8"
555 REM TWO HALVES
560 DATA
565 DATA"BR58BD34NU28ND28BR44BD1
2C0NR8U4R8U4L8BU4L2R12L6BU4R4L8U
4R8U4L8"
570 DATA"BR36BD46S8R4L2U12NGBR6B
D12RBR4R8U12L8D12"
575 REM ONE THIRD
580 DATA"BR58BD34NU28M-26,+15M+2
6,-15M+26,+15BR20BU2R8U4NL8U4L8B
U4L2R12L6BU4U8"
585 DATA
590 DATA"BR14BD46S8R8U12L8D12BR1
2RBR3R7U6NL7U6NL7BR4R7D6NL7D6NL7
BR4R7U6NL7U6L7"
595 REM TWO THIRDS
600 DATA"BR58BD34NU28M+26,+15BR2
0BU2R8U4NL8U4L8BU4L2R12L6BU4R4L8
U4R8U4L8"
605 DATA"BR58BD34M-26,+15"
610 DATA"BR12BD46S8R8U12L8D12BR1
2RBR4NU12R8U6NL8BU6NL8BR4D12R8U6
L8U6R8BR4ND2R8D12"
615 REM THREE THIRDS
620 DATA
625 DATA"BR58BD34NU28M-26,+15M+2
6,-15M+26,+15BR20BU2C0R8U4NL8U4L
8BU4L2R12L6BU4L4R8U4NL8U4L8"
630 DATA"BR36BD46S8R4L2U12NGBR6B
D12RBR4R8U12L8D12"
635 REM ONE FOURTH
640 DATA"BR58BD34NU28ND28NL32R32
BR22BD12U8D4L8U4BU4L2R12L6BU4U8"
645 DATA
650 DATA"BR20BD46S8R8U12L8D12BR1
2RBR4NR8U6R8U6NL8BR4NR8D6R8D6L8"
655 REM TWO FOURTHS
660 DATA"BR58BD34NU28ND28R32BR22
BD12U8D4L8U4BU4L2R12L6BU4R4L8U4R
8U4L8"
665 DATA"BR58BD34L32"
670 DATA"BR34BD46S8R8U12L8D12BR1
2RBR4R8U6L8U6R8"
675 REM THREE FOURTHS
680 DATA"BR58BD34NU28R32BR22BD12
U8D4L8U4BU4L2R12L6BU4L4R8U4NL8U4
L8"
685 DATA"BR58BD34NL32D28"
690 DATA"BR20BD46S8R8U12L8D12BR1
2RBR4BU12ND2R8D12BR4R8U6L8U6R8"
695 REM FOUR FOURTHS
700 DATA
705 DATA"BR58BD34NU28ND28NL32R32
BR22BD12C0U8D4L8U4BU4L2R12L6BU4B
R4U8D4L8U4"
710 DATA"BR36BD46S8R4L2U12NGBR6B
D12RBR4R8U12L8D12"
715 REM ONE FIFTH
720 DATA"BR58BD34NU28M-30,-10M+3
0,+10M+30,-10M-30,+10NG22NF22BR4
6BD12R8U4L8U4NR8BU4L2R12L6BU4U8"
725 DATA
730 DATA"BR32BD46S8R8U12L8D12BR1
2RBR4NR8U6R8U6NL8"
735 REM TWO FIFTHS
740 DATA"BR58BD34NU28M+30,-10M-3
0,+10NG22NF22BR46BD12R8U4L8U4NR8
BU4L2R12L6BU4R4L8U4R8U4L8"
745 DATA"BR58BD34M-30,-10"
750 DATA"BR32BD46S8R8U12L8D12BR1
2RBR4BU12D6R8U6D12"
755 REM THREE FIFTHS
760 DATA"BR58BD34NU28M+30,-10M-3
```

```
Ø,+1ØNF22BR46BD12R8U4L8U4NR8BU4L
2R12L6BU4L4R8U4NL8U4L8"
765 DATA"BR58BD34M-3Ø,-1ØM+3Ø,+1
ØG22"
77Ø DATA"BR32BD46S8R8U12L8D12BR1
2RBR4U12NR8D6R8D6NL8"
775 REM FOUR FIFTHS
78Ø DATA"BR58BD34NU28M+3Ø,-1ØM-3
Ø,+1ØBR46BD12R8U4L8U4NR8BU4L2R12
L6BU4BR4U8D4L8U4"
785 DATA"BR58BD34NU28M-3Ø,-1ØM+3
Ø,+1ØNG22NF22"
79Ø DATA"BR32BD46S8R8U12L8D12BR1
2RBR4U12NR8D6R8NU6D6NL8"
795 REM FIVE FIFTHS
8ØØ DATA
8Ø5 DATA"BR58BD34NU28M-3Ø,-1ØM+3
Ø,+1ØM+3Ø,-1ØM-3Ø,+1ØNG22NF22BR4
6BD12C0R8U4L8U4NR8BU4L2R12L6BU4L
4R8U4L8U4R8"
81Ø DATA"BR36BD46S8R4L2U12NGBR6B
D12RBR4R8U12L8D12"
815 REM ONE SIXTH
82Ø DATA"BR58BD34NU28ND28M-26,+1
5M+52,-3ØM-26,15M+26,+15M-52,-3Ø
BR7ØBD28NU4R8U4L8U4NR8BU4L2R12L6
BU4U8"
825 DATA
83Ø DATA"BR14BD46S8R8U12L8D12BR1
2RBR5NU12BR5NU12R8U6NL8BU6NL8BR4
ND2R8D12"
835 REM TWO SIXTHS
84Ø DATA"BR58BD34NU28ND28M-26,+1
5M+52,-3ØM-26,15M+26,+15M-26,-15
BR44BD12NU4R8U4L8U4NR8BU4L2R12L6
BU4R4L8U4R8U4L8"
845 DATA"BR58BD34M-26,-15"
85Ø DATA"BR14BD46S8R8U12L8D12BR1
2RBR3R7U6NL7U6NL7BR4R7D6NL7D6NL7
BR4R7U6NL7U6L7"
855 REM THREE SIXTHS
86Ø DATA"BR58BD34NU28ND28M+26,-1
5M-26,15M+26,+15M-26,-15BR44BD12
NU4R8U4L8U4NR8BU4L2R12L6BU4L4R8U
4NL8U4L8"
865 DATA"BR58BD34M-26,-15M+26,+1
5M-26,+15"
87Ø DATA"BR34BD46S8R8U12L8D12BR1
2RBR4R8U6L8U6R8"
875 REM FOUR SIXTHS
88Ø DATA"BR58BD34NU28M+26,-15M-2
6,15M+26,+15M-26,-15BR44BD12NU4R
8U4L8U4NR8BU4L2R12L6BU4BR4U8D4L8
U4"
885 DATA"BR58BD34ND28M-26,-15M+2
6,+15M-26,+15"
89Ø DATA"BR12BD46S8R8U12L8D12BR1
2RBR4NU12R8U6NL8BU6NL8BR4D12R8U6
L8U6R8BR4ND2R8D12"
895 REM FIVE SIXTHS
9ØØ DATA"BR58BD34NU28M+26,-15M-2
6,15BR44BD12NU4R8U4L8U4NR8BU4L2R
12L6BU4L4R8U4L8U4R8"
9Ø5 DATA"BR58BD34ND28M-26,-15M+2
6,+15M-26,+15M+26,-15M+26,+15"
91Ø DATA"BR12BD46S8R8U12L8D12BR1
2RBR4NU12R8U6NL8U6NL8BR4R8D6NL8D
6NL8BR4R8U6NL8U6L8"
915 REM SIX SIXTHS
92Ø DATA
925 DATA"BR58BD34NU28ND28M-26,+1
5M+52,-3ØM-26,15M+26,+15M-52,-3Ø
BR7ØBD28C0NU4R8U4L8U4NR8BU4L2R12
L6BU4L4R8U4L8D4U8R8"
93Ø DATA"BR36BD46S8R4L2U12NGBR6B
D12RBR4R8U12L8D12"
935 REM ONE SEVENTH
94Ø DATA"BR58BD34NU28M-24,-2ØM+2
4,+2ØM-3Ø,+4M+3Ø,-4M-16,+25M+16,
-25M+16,+25M-16,-25M+3Ø,+4M-3Ø,-
4M+24,-2ØBR28BD32U8L8ND2BU4L2R12
L6BU4U8"
945 DATA
95Ø DATA"BR14BD46S8R8U12L8D12BR1
2RBR5NU12BR5BU12D6R8U6D12BR5R8U6
NL8U6L8"
955 REM TWO SEVENTHS
96Ø DATA"BR58BD34NU28M-3Ø,+4M+3Ø
,-4M-16,+25M+16,-25M+16,+25M-16,
-25M+3Ø,+4M-3Ø,-4M+24,-2ØBR28BD3
2U8L8ND2BU4L2R12L6BU4R4L8U4R8U4L
8"
965 DATA"BR58BD34M-24,-2Ø"
97Ø DATA"BR12BD46S8R8U12L8D12BR1
2RBR4NR8U6R8U6NL8BR4ND12R8D6NL8D
6NL8BR4NR8U12R8BD6NL8D6"
975 REM THREE SEVENTHS
98Ø DATA"BR58BD34NU28M-16,+25M+1
6,-25M+16,+25M-16,-25M+3Ø,+4M-3Ø
,-4M+24,-2ØBR28BD32U8L8ND2BU4L2R
12L6BU4L4R8U4NL8U4L8"
985 DATA"BR58BD34M-24,-2ØM+24,+2
ØM-3Ø,+4"
99Ø DATA"BR12BD46S8R8U12L8D12BR1
ØRBR4BU12D6R8U6D12BR4NR8U6R8U6NL
8BR4ND6R8D6NL8D6"
995 REM FOUR SEVENTHS
1ØØØ DATA"BR58BD34NU28M+16,+25M-
16,-25M+3Ø,+4M-3Ø,-4M+24,-2ØBR28
BD32U8L8ND2BU4L2R12L6BU4BR4U8D4L
8U4"
1Ø05 DATA"BR58BD34M-24,-2ØM+24,+
2ØM-3Ø,+4M+3Ø,-4M-16,+25"
1Ø1Ø DATA"BR14BD46S8R8U12L8D12BR
12RBR4R8U6L8U6R8BR4ND2R8D12BR6U1
2"
1Ø15 REM FIVE SEVENTHS
1Ø2Ø DATA"BR58BD34NU28M+3Ø,+4M-3
Ø,-4M+24,-2ØBR28BD32U8L8ND2BU4L2
R12L6BU4L4R8U4L8U4R8"
1Ø25 DATA"BR58BD34M-24,-2ØM+24,+
2ØM-3Ø,+4M+3Ø,-4M-16,+25M+16,-25
M+16,+25"
1Ø3Ø DATA"BR14BD46S8R8U12L8D12BR
12RBR3BU1ØU2R8D12BR6U12BR6D6R8U6
D12"
1Ø35 REM SIX SEVENTHS
1Ø4Ø DATA"BR58BD34NU28M+24,-2ØBR
28BD32U8L8ND2BU4L2R12L6BU4NL4R4U
4L8ND4U4R8"
1Ø45 DATA"BR58BD34M-24,-2ØM+24,+
2ØM-3Ø,+4M+3Ø,-4M-16,+25M+16,-25
M+16,+25M-16,-25M+3Ø,+4"
1Ø5Ø DATA"BR12BD46S8R8U12L8D12BR
12RBR4NU12R8U6NL8U6NL8BR4NR8D6R8
D6NL8BR3BU1ØU2R8D12"
1Ø55 REM SEVEN SEVENTHS
1Ø6Ø DATA
1Ø65 DATA"BR58BD34NU28M-24,-2ØM+
24,+2ØM-3Ø,+4M+3Ø,-4M-16,+25M+16
,-25M+16,+25M-16,-25M+3Ø,+4M-3Ø,
-4M+24,-2ØBR28BD32C0U8L8ND2BU4L2
R12L6BU4BR4U8L8D2"
1Ø7Ø DATA"BR36BD46S8R4L2U12NGBR6
BD12RBR4R8U12L8D12"
1Ø75 REM ONE EIGHTH
1Ø8Ø DATA"BR58BD34NU28ND28NL32NR
32NE22NF22NG22NH22BR44BD12NU4R8U
```


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```
8D4L8U4NR8BU4L2R12L6BU4U8"
1085 DATA
1090 DATA"BR14BD46S8R8U12L8D12BR
12RBR5NU12BR5NR8U6R8U6NL8BR5NR8D
6R8D6L8"
1095 REM TWO EIGHTHS
1100 DATA"BR58BD34NU28ND28NL32NR
32NE22NF22NG22BR44BD12NU4R8U8D4L
8U4NR8BU4L2R12L6BU4R4L8U4R8U4L8"
1105 DATA"BR58BD34NH22"
1110 DATA"BR20BD46S8R8U12L8D12BR
12RBR4NR8U6R8U6NL8BR4NR8D6R8D6L8
"
1115 REM THREE EIGHTHS
1120 DATA"BR58BD34NU28ND28NR32NE
22NF22NG22BR44BD12NU4R8U8D4L8U4N
R8BU4L2R12L6BU4L4R8U4NL8U4L8"
1125 DATA"BR58BD34NH22NL32"
1130 DATA"BR14BD46S8R8U12L8D12BR
12RBR3R7U6NL7U6NL7BR4ND2R7D12BR5
R7U6L7U6R7"
1135 REM FOUR EIGHTHS
1140 DATA"BR58BD34NU28ND28NR32NE
22NF22BR44BD12NU4R8U8D4L8U4NR8BU
4L2R12L6BU4BR4U8D4L8U4"
1145 DATA"BR58BD34NH22NL32NG22"
1150 DATA"BR34BD46S8R8U12L8D12BR
12RBR4R8U6L8U6R8"
1155 REM FIVE EIGHTHS
1160 DATA"BR58BD34NU28NR32NE22NF
22BR44BD12NU4R8U8D4L8U4NR8BU4L2R
12L6BU4L4R8U4L8U4R8"
1165 DATA"BR58BD34NH22NL32NG22ND
28"
1170 DATA"BR12BD46S8R8U12L8D12BR
12RBR4NU12R8U6NL8BU6NL8BR4R7D6L7
D6R7BR4R7U6L7U6R7"
1175 REM SIX EIGHTHS
1180 DATA"BR58BD34NU28NR32NE22BR
44BD12NU4R8U8D4L8U4NR8BU4L2R12L6
BU4L4NU4R8U4L8U4R8"
1185 DATA"BR58BD34NH22NL32NG22ND
28NF22"
1190 DATA"BR20BD46S8R8U12L8D12BR
12RBR4BU12ND2R8D12BR4R8U6L8U6R8"
1195 REM SEVEN EIGHTHS
1200 DATA"BR58BD34NU28NE22BR44BD
12NU4R8U8D4L8U4NR8BU4L2R12L6BU4B
R4U8L8D2"
1205 DATA"BR58BD34NH22NL32NG22ND
28NF22NR32"
1210 DATA"BR14BD46S8R8U12L8D12BR
12RBR3NU12R7U6NL7U6NL7BR4ND2R7D1
2BR5R7U6L7U6R7"
1215 REM EIGHT EIGHTHS
1220 DATA
1225 DATA"BR58BD34NU28ND28NL32NR
32NE22NF22NG22NH22BR44BD12C0NU4R
8U8D4L8U4NR8BU4L2R12L6BU4L4R8U4N
L8U4L8D8"
1230 DATA"BR36BD46S8R4L2U12NGBR6
BD12RBR4R8U12L8D12"
1235 REM ONE NINTH
1240 DATA"BR58BD34NU28M-18,-22M+
18,+22M-30,-6M+30,+6M-26,+15M+26
,-15M-12,+26M+12,-26M+12,+26M-12
,-26M+26,+15M-26,-15M+30,-6M-30,
+6M+18,-22BR26BD34R8U4NU4L8U4NR8
BU4L2R12L6BU4U8"
1245 DATA
1250 DATA"BR22BD46S8R8U12L8D12BR
12RBR7NU12BR7NU12BR7NU12"
1255 REM TWO NINTHS
1260 DATA"BR58BD34NU28M-30,-6M+3
0,+6M-26,+15M+26,-15M-12,+26M+12
,-26M+12,+26M-12,-26M+26,+15M-26
,-15M+30,-6M-30,+6M+18,-22BR26BD
34R8U4NU4L8U4NR8BU4L2R12L6BU4R4L
8U4R8U4L8"
1265 DATA"BR58BD34M-18,-22"
1270 DATA"BR12BD46S8R8U12L8D12BR
12RBR4NR8U6R8U6NL8BR4R8D6L8D6R8B
R4NR8U6R8U6L8"
1275 REM THREE NINTHS
1280 DATA"BR58BD34NU28M-26,+15M+
26,-15M-12,+26M+12,-26M+12,+26M-
12,-26M+26,+15M-26,-15M+30,-6M-3
0,+6M+18,-22BR26BD34R8U4NU4L8U4N
R8BU4L2R12L6BU4L4R8U4NL8U4L8"
1285 DATA"BR58BD34M-18,-22M+18,+
22M-30,-6"
1290 DATA"BR14BD46S8R8U12L8D12BR
12RBR3R7U6NL7U6NL7BR4R7D6NL7D6NL
7BR4R7U6NL7U6L7"
1295 REM FOUR NINTHS
1300 DATA"BR58BD34NU28M-12,+26M+
12,-26M+12,+26M-12,-26M+26,+15M-
26,-15M+30,-6M-30,+6M+18,-22BR26
BD34R8U4NU4L8U4NR8BU4L2R12L6BU4B
R4U8D4L8U4"
1305 DATA"BR58BD34M-18,-22M+18,+
22M-30,-6M+30,+6M-26,+15"
1310 DATA"BR12BD46S8R8U12L8D12BR
10RBR4BU12D6R8U6ND12BR4D6R8U6ND1
2BR4D6R8U6D12"
1315 REM FIVE NINTHS
1320 DATA"BR58BD34NU28M+12,+26M-
12,-26M+26,+15M-26,-15M+30,-6M-3
0,+6M+18,-22BR26BD34R8U4NU4L8U4N
R8BU4L2R12L6BU4L4R8U4L8U4R8"
1325 DATA "BR58BD34M-18,-22M+18,
+22M-30,-6M+30,+6M-26,+15M+26,-1
5M-12,+26"
1330 DATA"BR12BD46S8R8U12L8D12BR
12RBR4R8U6L8U6R8BR4NR8D6R8D6NL8B
R4NU6R8U6L8U6R8"
1335 REM SIX NINTHS
1340 DATA"BR58BD34NU28M+26,+15M-
26,-15M+30,-6M-30,+6M+18,-22BR26
BD34R8U4NU4L8U4NR8BU4L2R12L6BU4L
4NU4R8U4L8U4R8"
1345 DATA"BR58BD34M-18,-22M+18,+
22M-30,-6M+30,+6M-26,+15M+26,-15
M-12,+26M+12,-26M+12,+26"
1350 DATA"BR12BD46S8R8U12L8D12BR
12RBR4NU12R8U6NL8BU6NL8BR4D12R8U
6L8U6R8BR4ND2R8D12"
1355 REM SEVEN NINTHS
1360 DATA"BR58BD34NU28M+30,-6M-3
0,+6M+18,-22BR26BD34R8U4NU4L8U4N
R8BU4L2R12L6BU4BR4U8L8D2"
1365 DATA "BR58BD34M-18,-22M+18,
+22M-30,-6M+30,+6M-26,+15M+26,-1
5M-12,+26M+12,-26M+12,+26M-12,-2
6M+26,+15"
1370 DATA"BR14BD46S8R8U12L8D12BR
12RBR2BU10U2R8ND12BR3ND2R8ND12BR
4ND12R8D6NL8D6L8"
1375 REM EIGHT NINTHS
1380 DATA"BR58BD34NU28M+18,-22BR
26BD34R8U4NU4L8U4NR8BU4L2R12L6BU
4L4R8U4NL8U4L8D8"
1385 DATA"BR58BD34M-18,-22M+18,+
22M-30,-6M+30,+6M-26,+15M+26,-15
M-12,+26M+12,-26M+12,+26M-12,-26
M+26,+15M-26,-15M+30,-6"
1390 DATA"BR12BD46S8R8U12L8D12BR
12RBR4NU12R8U6NL8U6NL8BR4D12R8U6
L8U6R8ND6BR4ND6R8D6NL8D6"
1395 REM NINE NINTHS
1400 DATA
1405 DATA"BR58BD34NU28M-18,-22M+
18,+22M-30,-6M+30,+6M-26,+15M+26
,-15M-12,+26M+12,-26M+12,+26M-12
,-26M+26,+15M-26,-15M+30,-6M-30,
+6M+18,-22BR26BD34C0R8U4NU4L8U4N
R8BU4L2R12L6BU4L4R8U8L8D4R8"
1410 DATA"BR36BD46S8R4L2U12NGBR6
BD12RBR4R8U12L8D12"
1415 DATA .5,1,.333,.667,1
1420 DATA .25,.5,.75,1,.2,.4,.6,
.8,1
1425 DATA .167,.333,.5,.667,.833
,1
1430 DATA .143,.286,.429,.571,.7
14,.857,1
1435 DATA .125,.25,.375,.5,.625,
.75,.875,1
1440 DATA .111,.222,.333,.444,.5
56,.667,.778,.889,1
1445 CLS:PRINT:PRINT:PRINT
1450 PRINTTAB(3)"PROBLEMS COMPLE
TED  = "NC+NW:PRINT
1455 PRINTTAB(3)"CORRECT RESPONS
ES   = "NC:PRINT
1460 PRINTTAB(3)"INCORRECT RESPO
NSES = "NW:PRINT
1465 TR=NC+NW:IFTR=0THENTR=1
1470 SC=INT(NC/TR*100)
1475 PRINTTAB(3)"YOUR TOTAL SCOR
E    = "SC"%":PRINT
1480 PRINTTAB(3)"ANOTHER TRY (Y/
N) OR (C) ?";
1485 X$=INKEY$:IFX$=""THEN1485
1490 IFX$="Y"THEN RUN
1495 IFX$="N"THEN CLS:END
1500 IFX$="C"THEN SCREEN1,1:GOTO
400
1505 GOTO1485
1510 CLS:PRINT@232,"PLEASE STAND
 BY";
1515 FORI=1TO44:TEM$=P$(I,1):P$(
I,1)=P$(I,3):P$(I,3)=TEM$:NEXT
1520 FORI=1TO44:TEM$=P$(I,2):P$(
I,2)=P$(I,4):P$(I,4)=TEM$:NEXT
1525 NG=1:GOTO115
```

Are you thinking about getting a new computer and don't know what to do...

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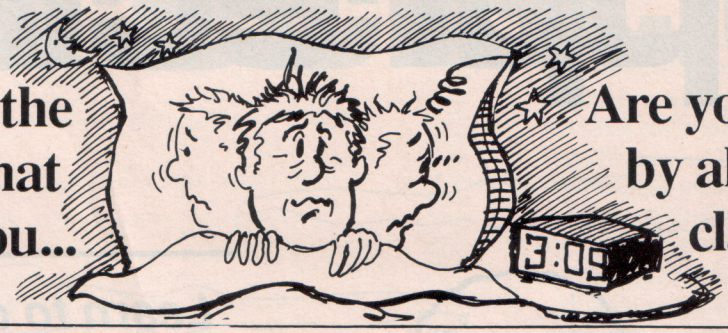

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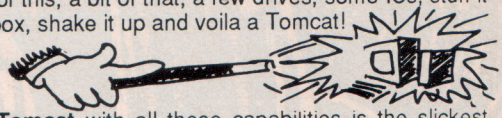

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Appreciatin'

Learn to get along with depreciation calculations

by David Macias

Very few obsessions equal the one accountants express when it comes to keeping their books in order. For them, every ledger entry must be accurate and properly placed. It makes common sense that if you pay $100 for office supplies the ledger reflect that $100 in cash was paid out and the office supply account increased by the same $100. Entering the cost of insurance is just as simple. To calculate this cost, divide the yearly cost by the number of months covered. This gives you the monthly amount of insurance expense to enter. But what about the wear and tear on your equipment? What value will the equipment have after one year? How do you record its depreciation? To answer these questions accountants create two separate accounts to cover the same piece of equipment.

The first account is the original purchase price of the equipment. If you paid

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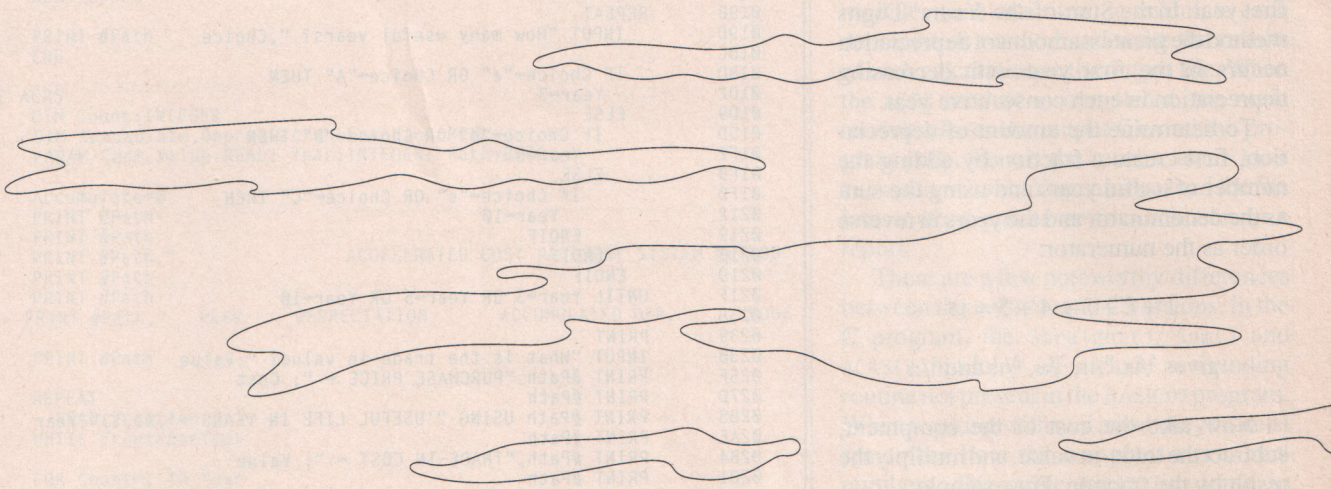
Depreciation



$100,000 for a VAX system, the ledger shows this amount for as long as you own the system. The second account is for the accumulated depreciation. Every month the accountant enters the amount of depreciation into this separate account. At specific intervals the accountant is required to prepare a balance sheet showing the financial position of a company or economic unit. For this balance sheet, the equipment account is adjusted by subtracting the amount of the accumulated depreciation from the original purchase price.

How do accountants come up with the amount of each month's depreciation? This amount is based on the expectation that a piece of equipment gradually declines in usefulness due to time and normal wear and tear. The cost is spread out over the estimated useful life of the equipment. This article covers three methods used to determine depreciation. These three methods are the Straight-Line method, the Sum-of-the-Years'-Digits method and the Accelerated Cost Recovery System, or ACRS. Each of these are used to determine the annual depreciation of an account. To get the monthly depreciation, divide the yearly amount by twelve.

OS-9

Listing 1: Depreciate.b09

```
PROCEDURE Depreciate
 0000
 0001       (* Appreciatin' Depreciation    *)
 0022       (* Written by David Macias      *)
 0043       (* Copyright (c) February 1991 *)
 0064       (* by Falsoft, Inc.             *)
 0085       (* Rainbow Magazine             *)
 00A6
 00A7       DIM Cost,Value:REAL
 00B2       DIM Year:INTEGER
 00B9       DIM Path:BYTE
 00C0       DIM Choice:STRING[1]
 00CC
 00CD       CREATE #Path,"account.out":WRITE
 00E3       RUN Title(Path)
 00ED       RUN GFX2("CLEAR")
 00FA
 00FB       PRINT
```

Straight-Line Method

With the Straight-Line method, the depreciation is determined by the following formula:

$$YD = \frac{\text{Cost - Trade}}{\text{Years of life}}$$

where YD is the yearly depreciation, Cost is the cost of the asset, and Trade is the trade-in value of the equipment.

For example, assume the cost of a piece of equipment is $10,000. The expected useful life is five years with a trade-in value of $2500. The equation looks like this:

$$YD = \frac{\$10{,}000 - \$2500}{5 \text{ years}} = \$1500 \text{ per year}$$

Each year, the accumulated depreciation increases by $1500 and the book value (cost minus accumulated depreciation)

decreases by $1500. At the end of the last useful year of the equipment, the book value is equal to the trade-in value. With this method, the amount of depreciation is the same each year.

Sum-of-the-Years'-Digits Method

The Straight-Line method may not reflect reality since the majority of material objects lose most of their value after the first year. In the Sum-of-the-Years'-Digits method the greatest amount of depreciation occurs in the first year with decreasing depreciation in each consecutive year.

To determine the amount of depreciation, first create a fraction by adding the number of useful years and using the sum as the denominator and the years in reverse order as the numerator:

$$1 + 2 + 3 + 4 + 5 = 15$$

gives $^5/_{15}$, $^4/_{15}$, $^3/_{15}$, $^2/_{15}$ and $^1/_{15}$

Now take the cost of the equipment, subtract the trade-in value, and multiply the result by the fraction. For example:

Year		Depreciation
1	$10,000 - $2500 * $^5/_{15}$ =	$2500
2	$10,000 - $2500 * $^4/_{15}$ =	$2200
3	$10,000 - $2500 * $^3/_{15}$ =	$1500
4	$10,000 - $2500 * $^2/_{15}$ =	$1000
5	$10,000 - $2500 * $^1/_{15}$ =	$500

Again, at the end of the last useful year of the equipment, the book value is equal to the trade-in value.

Accelerated Cost Recovery System

The ACRS method does not consider the trade-in value for depreciation calculations. The type of property and the percentage table are used to find the depreciation. Property is divided into several categories for calculation. These categories specify three years for cars and trucks, five or 10 years for machines and equipment, and 15 or 18 years for buildings. The percentage tables are established by the U.S. Congress and change from time to time. The tables used in the accompanying program are for personal property placed in service after 1980 and before 1987. For example, a car that cost $10,000 with a useful life of three years would be calculated as follows:

Year		Depreciation
1	$10,000 * .25 =	$2500
2	$10,000 * .38 =	$3800
3	$10,000 * .37 =	$3700

The total accumulated depreciation is $2500 + $3800 + $3700, or $10,000.

```
 00FD      PRINT
 00FF      PRINT
 0101      PRINT "------------------DEPRECIATION METHODS------------------"
 013F      PRINT
 0141      PRINT
 0143      INPUT "What is the original cost? ",Cost
 0166      PRINT
 0168      PRINT "       ENTER ONE"
 017C      PRINT
 017E      PRINT
 0180      PRINT "  A=3      B=5      C=10"
 019A
 019B      REPEAT
 019D        INPUT "How many useful years? ",Choice
 01BC
 01BD        IF Choice="a" OR Choice="A" THEN
 01D2          Year=3
 01D9        ELSE
 01DD          IF Choice="b" OR Choice="B" THEN
 01F2            Year=5
 01F9          ELSE
 01FD            IF Choice="c" OR Choice="C" THEN
 0212              Year=10
 0219            ENDIF
 021B          ENDIF
 021D        ENDIF
 021F      UNTIL Year=3 OR Year=5 OR Year=10
 0238
 0239      PRINT
 023B      INPUT "What is the trade-in value? ",Value
 025F      PRINT #Path,"PURCHASE PRICE = "; Cost
 027D      PRINT #Path
 0283      PRINT #Path USING "'USEFUL LIFE IN YEARS ='",X1,I3",Year
 02AE      PRINT #Path
 02B4      PRINT #Path,"TRADE-IN COST = "; Value
 02D1      PRINT #Path
 02D7      RUN GFX2("CLEAR")
 02E4      PRINT
 02E6      PRINT
 02E8      PRINT "RUNNING STRAIGHT-LINE METHOD"
 0308      RUN Straight(Cost,Value,Year,Path)
 0321      PRINT
 0323      PRINT "RUNNING SUM-OF-THE-YEAR DIGIT METHOD"
 034B      RUN Sum(Cost,Value,Year,Path)
 0364      PRINT
 0366      PRINT "RUNNING ACRS METHOD"
 037D      RUN ACRS(Cost,Value,Year,Path)
 0396      PRINT
 0398      CLOSE #Path
 039E      PRINT "DONE"
 03A6      END

PROCEDURE Straight
 0000      DIM Annual,Accumulate:REAL
 000B      DIM Count:INTEGER
 0012      PARAM Cost,Value:REAL; Year:INTEGER; Path:BYTE
 0029
 002A      Annual=(Cost-Value)/Year
 003B      Accumulate=0
 0043
 0044      PRINT #Path
 004A      PRINT #Path,"                          STRAIGHT-LINE METHOD"
 007E      PRINT #Path
 0084     PRINT #Path,"   YEAR     DEPRECIATION       ACCUMULATED DEP.       BOOK
VALUE"
 00CD      PRINT #Path
 00D3
 00D4      FOR Count=1 TO Year
 00E5        Accumulate=Accumulate+Annual
 00F1        PRINT #Path USING "X4,I3,X5,R10.2>,X12,R10.2>,X8,R10.2>",
              Count,Annual,Accumulate,Cost-Accumulate
 0132      NEXT Count
 013D
 013E      PRINT #Path
 0144      END

PROCEDURE Sum
 0000      DIM Annual,Accumulate,Depreciation:REAL
 000F      DIM Count,Fraction:REAL
 001A      PARAM Cost,Value:REAL; Year:INTEGER; Path:BYTE
 0031
 0032      Fraction=1
 003A      Accumulate=0
 0042
 0043      FOR Count=1 TO Year
 0056        Fraction=Fraction+Count
 0062      NEXT Count
 006D
 006E      PRINT #Path
 0074      PRINT #Path
```

```
 007A       PRINT #Path,"                    SUM-OF-THE-YEARS' DIGIT METHOD"
 00B3       PRINT #Path
 00B9      PRINT #Path,"   YEAR     DEPRECIATION       ACCUMULATED DEP.       BOOK
VALUE"
 0102       PRINT #Path
 0108
 0109       FOR Count=1 TO Year
 011C         Depreciation=(Cost-Value)*((Year-Count+1)/(Fraction-1))
 013D         Accumulate=Accumulate+Depreciation
 0149         PRINT #Path USING "X4,I3,X5,R10.2>,X12,R10.2>,X8,R10.2>",
               Count,Depreciation,Accumulate,Cost-Accumulate
 018A       NEXT Count
 0195
 0196       PRINT #Path
 019C       END

PROCEDURE ACRS
 0000       DIM Count:INTEGER
 0007       DIM Accumulate,Depreciation,Fraction:REAL
 0016       PARAM Cost,Value:REAL; Year:INTEGER; Path:BYTE
 002D
 002E       Accumulate=0
 0036       PRINT #Path
 003C       PRINT #Path
 0042       PRINT #Path,"              ACCELERATED COST RECOVERY SYSTEM METHOD"
 0081       PRINT #Path
 0087       PRINT #Path
 008D      PRINT #Path,"   YEAR     DEPRECIATION       ACCUMULATED DEP.       BOOK
VALUE"
 00D6       PRINT #Path
 00DC
 00DD       REPEAT
 00DF         READ Fraction
 00E4       UNTIL Fraction=Year
 00F1
 00F2       FOR Count=1 TO Year
 0103         READ Fraction
 0108         Depreciation=Cost*Fraction
 0114         Accumulate=Accumulate+Depreciation
 0120         PRINT #Path USING "X4,I3,X5,R10.2>,X12,R10.2>,X8,R10.2>",
               Count,Depreciation,Accumulate,Cost-Accumulate
```

The Programs

The two programs accompanying this article (one written in C and the other written in BASIC09) function pretty much like each other. The main module opens an output file named `accountant.out`. A series of questions prompts the user for the raw data needed to generate a depreciation report. The data is then written to the output file and the main module calls the three modules (one at a time) to calculate each depreciation method and write the results of each calculation to the output file. When the `ACRS` module is completed, the main module closes the output file and the program ends. To see the results, enter `list accountant.out`. You can also load the file into a word processor for inclusion in a report.

There are a few noteworthy differences between the BASIC09 and C versions. In the C program, the `Straight()`, `Sum()` and `ACRS()` modules all include a rounding routine not present in the BASIC09 program. When working with real numbers you must remember how the computer stores real numbers. The value 200.127 is stored in memory as .200127E-3. For this value, .200127 is called the *mantissa* and E-3 is the *exponent* (power of 10). In C, if you print this value with the format %5.2f the 7 is dropped,

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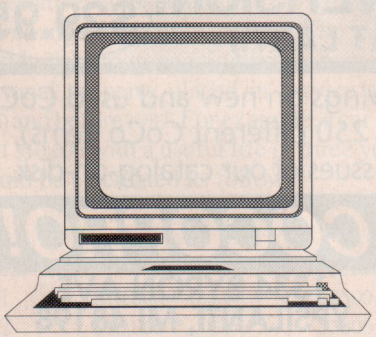

```
 0161       NEXT Count
 016C
 016D       PRINT #Path
 0173
 0174       DATA 3,.25,.38,.37,5,.15,.22,.21,.21,.21,10
 01B9       DATA .08,.14,.12,.1,.1,.1,.09,.09,.09,.09
 0203       END

PROCEDURE Title
 0000       PARAM Path:BYTE
 0007
 0008       PRINT #Path,CHR$(12)
 0012       PRINT #Path
 0018       PRINT #Path,"                                                  "
 0055       PRINT #Path,"                          | Three  Depreciation  Methods |\"
 0092       PRINT #Path,"                          ------------------------------\"
 00CF       PRINT #Path,"                           \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\"
 010C       PRINT #Path
 0112       END
```

Listing 2: Depreciate.c

```
/*
**   Appreciatin' Depreciation
**   Written by David Macias
**   Copyright (c) February 1991
**   by Falsoft, Inc.
**   Rainbow Magazine
*/

#include <stdio.h>
#define Clear(path) write(path,"\x0C",1)
main()
{
     float     cost, value;
     int       year, path;
     char      choice;
     FILE      *out;

     out = fopen("account.out", "w");
     path = 1;

     pffinit();
     title(out);
     Clear(path);
     printf("\n\n\n");
     printf("------------------DEPRECIATION METHODS-----------------\n\n\n");
     printf("What is the original cost? ");
     scanf("%f", &cost);
     printf("\n\n       ENTER ONE\n\n\n");
     printf("  A=3     B=5    C=10\n\n");
     printf("How many useful years? ");

     do
     {
          choice = getchar();

          switch(choice)
          {
               case 'a':
               case 'A':
                    year = 3;
                    break;

               case 'b':
               case 'B':
                    year = 5;
                    break;

               case 'c':
               case 'C':
                    year = 10;
                    break;

               default:
                    year = 0;
                    break;
          }
     } while(year != 3 && year != 5 && year != 10);

     printf("\n\nWhat is the trade-in value? ");
     scanf("%f", &value);
     fprintf(out, "PURCHASE PRICE = %5.2f\n\n", cost);
     fprintf(out, "USEFUL LIFE IN YEARS = %d\n\n", year);
     fprintf(out, "TRADE-IN COST = %5.2f\n\n", value);
```

```
     Clear(path);
     printf("\nRUNNING STRAIGHT-LINE METHOD\n");
     straight(cost, value, year, out);
     printf("\nRUNNING SUM-OF-THE-YEARS' METHOD\n");
     sum(cost, value, year, out);
     printf("\nRUNNING ACRS METHOD\n");
     acrs(cost, value, year, out);

     fclose(out);
}

straight(st_cost, st_value, st_year, st_out)
float st_cost, st_value;
int   st_year;
FILE  *st_out;
{
     float annual, accumulate;
     int   count;

     annual = (st_cost - st_value) / st_year;
     accumulate = 0;
     fprintf(st_out, "\n                              STRAIGHT-LINE METHOD\n\n");

     fprintf(st_out,
     "   YEAR      DEPRECIATION       ACCUMULATED DEP.       BOOK VALUE\n\n");

     for(count = 1; count <= st_year; ++count)
     {
          accumulate += annual;

          if((count == st_year) && ((st_cost - accumulate) != st_value))
               accumulate += ((st_cost - accumulate) - st_value);

          fprintf(st_out,
               "    %3d      %10.2f            %10.2f        %10.2f\n",
               count, annual, accumulate, (st_cost-accumulate));
     }
     fprintf(st_out, "\n");
}

sum(s_cost, s_value, s_year, s_out)
```

and the 2 next to it is raised by one. In BASIC09, if you print the same value using the format R5.2, the 7 is merely hacked off with no affect on the place values to its left. *The 7 is still in memory*, though. For this reason, some reports generated by the BASIC09 program show the final book value in the ACRS report with a minus sign, even though the amount displayed is 0.00. Other differences reflect the various attributes of these two languages.

The C language has the advantage of being brief. In the ACRS module, the BASIC09 version uses a data statement to store the fraction table. A REPEAT/UNTIL loop is used to match the correct sequence of fractions to the corresponding year. The C version stores the fraction table in an array and uses one line of code to match the list of fractions to their corresponding year. The following line is an example of the quick and efficient C version:

```
while(percentage[cmp++] != a_year)
```

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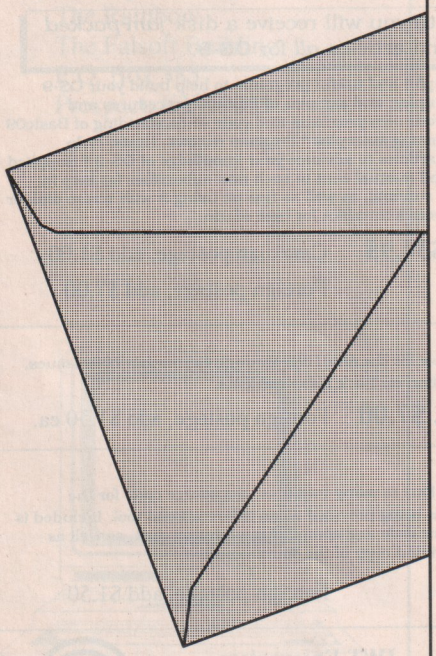
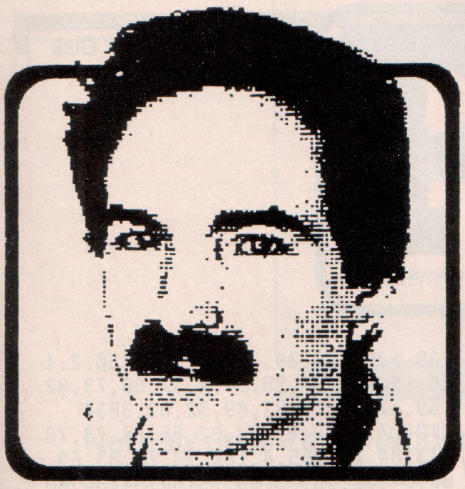


```
float s_cost, s_value;
int   s_year;
FILE  *s_out;
{
     float annual, accumulate, depreciation, round;
     int   count, fraction;

     fraction = 1;
     accumulate = 0;

     for(count = 1; count <= s_year; ++count)
          fraction += count;

     fprintf(s_out,
     "\n\n\n                    SUM-OF-THE-YEARS' DIGIT METHOD\n\n");

     fprintf(s_out,
     "   YEAR      DEPRECIATION        ACCUMULATED DEP.        BOOK VALUE\n\n");

     for(count = 1; count <= s_year; ++count)
     {
          depreciation = (((s_cost-s_value)*((s_year-count+1))/(fraction-1)));
          accumulate += depreciation;

          if((count == s_year) && ((s_cost - accumulate) != s_value))
          {
               round = ((s_cost - accumulate) - s_value);
               depreciation += round;
               accumulate += round;
          }

          fprintf(s_out,
               "   %3d      %10.2f             %10.2f         %10.2f\n",
               count, depreciation, accumulate, (s_cost - accumulate));
     }
     fprintf(s_out,"\n");
}

acrs(a_cost, a_value, a_year, a_out)
float a_cost, a_value;
int   a_year;
FILE  *a_out;
{
     float accumulate, depreciation, fraction, round;
     int   count, cmp;

     static float percentage[] = {
          3, .25, .38, .37, 5, .15, .22, .21, .21, .21,
          10, .08, .14, .12, .1, .1, .1, .09, .09, .09, .09
     };

     cmp = 0;
     accumulate = 0;

     fprintf(a_out,
     "\n\n                ACCELERATED COST RECOVERY SYSTEM METHOD\n\n\n");

     fprintf(a_out,
     "   YEAR      DEPRECIATION       ACCUMULATED DEP.         BOOK VALUE\n\n");

     while(percentage[cmp++] != a_year)
          ;

     for(count = 1; count <= a_year; ++count)
     {
          depreciation = a_cost * percentage[cmp++];
          accumulate += depreciation;

          if((count == a_year) && ((a_cost - accumulate) != 0))
          {
               round = (0 - (a_cost - accumulate));
               depreciation -= round;
               accumulate -= round;
          }

          fprintf(a_out,
          "   %3d      %10.2f             %10.2f         %10.2f\n",
          count, depreciation, accumulate, a_cost - accumulate);
     }
     fprintf(a_out, "\n");
}

title(t_out)
FILE *t_out;
{
     fprintf(t_out, "%c", 12);
     fprintf(t_out,"\n                                                  _____________________________\n");
     fprintf(t_out,"                                                 /| Three Depreciation Methods |\n");
     fprintf(t_out,"                                                 /-----------------------------\n");
     fprintf(t_out,"                                                 ////////////////////////////\n\n");
}
```



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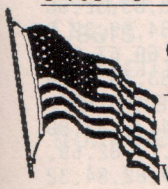

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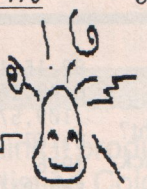

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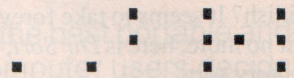

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by David C. Enger

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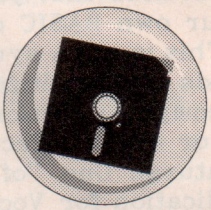
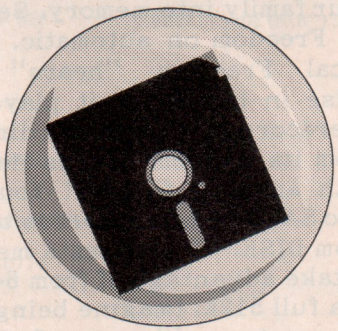
Dir Sort is a machine-language directory sort utility, which uses a modified bubble sort routine. The program was designed to run on a CoCo 3 under DECB Version 2.1. However, *Dir Sort* works on any 32K or more CoCo with either Disk BASIC 1.0 or 1.1.

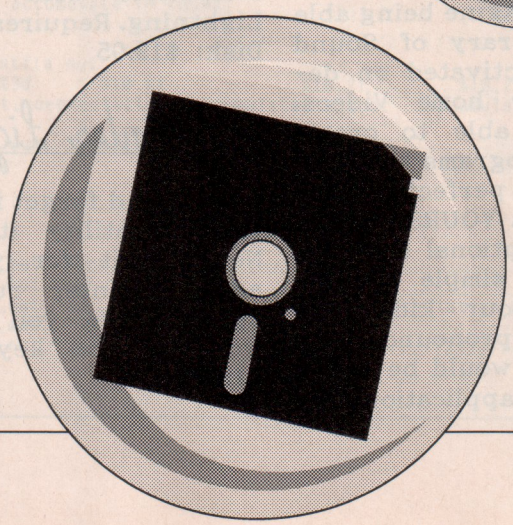
To install *Dir Sort* on your disk, run DIRSORT to generate and save the machine-language program. Enter PCLEAR4:LOADM"DIRSORT":EXEC and follow the prompts to quickly sort your directory.

The Listing: DIRSORT

```
0 'QUICK DIRECTORY SORTER
1 'BY DAVID C. ENGER
2 'COPYRIGHT (C) JANUARY 1991
3 'BY FALSOFT, INC.
30 WIDTH32:CLS:PRINT
40 PRINT"POKING DIR SORT/BIN INT
O MEMORY"
50 PRINT
60 AD=&HE00
70 FORX = 1 TO 13
80 T=0:C=0
90 FORY=1TO45
100 READA:POKEAD,A
110 AD=AD+1:C=C+A
120 NEXTY
130 READA:IFA<>C THENPRINT"ERROR
 IN LINE"X*10+160:END
140 NEXTX
150 PRINT"SAVING 'DIRSORT.BIN'"
160 SAVEM"DIRSORT.BIN",&HE00,&H1
046,&HE00
170 DATA 189,15,124,142,15,181,1
89,15,156,142,15,206,189,15,156,
189,15,145,189,15,124,142,15,181
,189,15,156,142,16,17,189,15,156
,189,14,43,142,16,40,189,15,156,
57,189,14,4723
180 DATA 58,189,14,142,189,15,11
2,134,0,183,255,64,57,16,142,16,
70,190,192,6,134,2,167,132,182,1
5,111,167,137,0,1,134,17,167,137
,0,2,134,3,183,15,108,189,14,118
,4313
190 DATA 166,164,129,255,39,17,1
82,15,108,129,11,39,10,124,15,10
8,49,169,1,0,126,14,87,16,191,15
,109,57,16,175,137,0,4,182,15,10
8,167,137,0,3,173,159,192,4,109,
3926
200 DATA 137,0,6,38,1,57,57,204,
15,89,253,15,102,189,14,197,204,
15,75,253,15,102,189,14,197,204,
15,61,253,15,102,189,14,197,204,
15,47,253,15,102,189,14,197,204,
15,4743
210 DATA 33,253,15,102,189,14,19
7,204,15,21,253,15,102,189,14,19
7,57,190,15,109,191,15,106,142,1
6,70,127,15,104,110,159,15,102,3
1,18,52,16,31,33,127,15,105,236,
132,16,4168
220 DATA 174,137,0,32,237,137,0,
32,16,175,129,124,15,105,182,15,
105,129,8,38,232,53,16,134,1,183
,15,104,48,137,0,32,188,15,106,3
8,203,252,15,106,131,0,32,253,15
,4099
230 DATA 106,182,15,104,38,183,5
7,236,137,0,32,16,163,132,36,223
,126,14,213,236,137,0,34,16,163,
137,0,2,36,209,126,14,213,236,13
7,0,36,16,163,137,0,4,36,195,126
,4422
240 DATA 14,213,236,137,0,38,16,
163,137,0,6,36,181,126,14,213,23
6,137,0,40,16,163,137,0,8,36,167
,126,14,213,166,137,0,42,161,137
,0,10,36,154,126,14,213,15,21,40
55
250 DATA 0,0,16,166,8,21,70,0,16
,142,16,70,190,192,6,134,3,126,1
4,67,52,18,134,96,142,4,0,167,13
2,48,137,0,1,140,6,0,38,245,53,1
8,57,52,2,173,159,3131
260 DATA 160,0,39,250,53,2,57,52
,38,16,174,129,16,191,0,136,166,
128,129,255,39,7,173,159,160,2,1
26,15,165,53,38,57,4,37,68,73,82
,69,67,84,79,82,89,32,83,3834
270 DATA 79,82,84,32,85,84,73,76
,73,84,89,255,4,160,73,78,83,69,
82,84,32,68,73,83,75,69,84,84,69
,32,73,78,32,68,82,73,86,69,32,4
8,32,65,78,68,32,3314
280 DATA 32,80,82,69,83,83,32,65
,78,89,32,75,69,89,32,84,79,32,8
3,79,82,84,32,68,73,82,69,67,84,
79,82,89,46,255,4,165,83,79,82,8
4,73,78,71,32,68,3358
290 DATA 73,82,69,67,84,79,82,89
,33,33,33,255,4,165,68,73,82,69,
67,84,79,82,89,32,83,79,82,84,32
,67,79,77,80,76,69,84,69,68,33,3
3,33,255,0,0,0,3256
```







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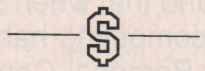
Computerized guidance for calculated risks

Bond Calculator



by Dale Tinklepaugh

Bonds are sufficiently different from other investment forms to deserve special treatment. Bond prices fluctuate inversely with current market interest rates. This makes it hard to analyze the rate of return on a bond investment because the amount invested affects the calculation in a complex way. *Bondcalc* calculates two different measures of rate of return: Current yield and yield to maturity.

Before explaining how the program runs, a summary of bond concepts and terminology might be helpful. Once a bond is issued it can be sold several times during its *term*, or life. *Maturity* is the end of the bond's term. At maturity, the bond is redeemed for its face amount, called the *par value*.

Unless the bond is a zero coupon bond, interest is paid periodically, usually semiannually. A *coupon* is one of several promisory notes attached to some bonds. The coupons are detached and cashed in as the bond interest payments become due. Registered bond holders automatically receive interest payments by mail from the issuing corporation.

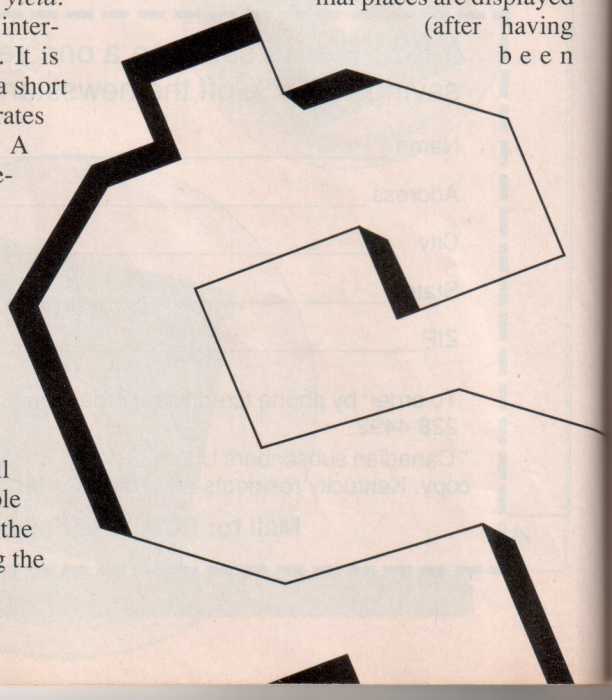
Dale Tinklepaugh has been a professional programmer for several years in electrical engineering and graphics applications. He markets some of his own programs through his business, Prometheus Software. Dale, his wife and their two children enjoy camping and spending time in the mountains. He can be contacted at P.O. Box 15859, Long Beach, CA 90815. Please include an SASE when requesting a reply.

Debenture bonds are unsecured, whereas *mortgage bonds* are secured by specific corporate assets. A *callable* bond allows the issuing corporation to repurchase the bond on a certain date before maturity. An owner of a *convertible bond* can elect to exchange the bond for stock under specified conditions.

When interest rates of alternative investments increase above the bond interest rate, investors have no incentive to purchase the lower interest bond unless the purchase price is discounted to compensate. On the other hand, when market rates are lower than a bond's rate, the bond owner will not sell unless paid a *premium*, or increased price.

An investor is primarily interested in two measures of a bond's profitability. The first area of interest is the *current yield*. This is simply the ratio of annual interest to the bond's purchase price. It is useful when the bond is held for a short term, a year or two, and interest rates are expected to remain stable. A second measure for the rate of return is known as the *yield to maturity*. This rate is figured with the purchase premium or discount apportioned equally among the remaining years of the bond's term. Hence a given purchase price results in a certain rate of return for the remaining life of the bond. An exception is the callable bond when the call option is exercised. For a callable bond it is a good idea to prepare the yield to maturity calculation using the specific call conditions outlined in the bond agreement.

Bondcalc takes a few seconds to perform the yield to maturity calculation since there is no formula that gives an exact result. The variable being solved for is an exponent in two separate terms of the governing equation. But given a value for the exponent, other terms can be calculated as desired. First, an approximation of the yield to maturity is obtained with a simplified equation. Then, the future value of the bond is computed using the approximate yield to maturity. The result should equal the par value of the bond. If not, the approximation is successively refined until the difference is less than 0.5 cents or until the yield to maturity is modified out to six decimal places. Only five of those decimal places are displayed (after having been



multiplied by 100 to give the answer as a percent).

The quoted price for a bond does not include a small amount of interest accrued from the time of the last interest payment to the time of the sale. This amount is calculated at the time of the sale using the bond interest rate and using par value as the principle amount. This interest is added to the purchase price of the bond along with the commission.

The Program

The program presents a menu with the following five options: 1) Current Yield; 2) Yield to Maturity; 3) Price for a Current Yield; 4) Price for a Yield to Maturity; and 5) Exit Program. Press the corresponding numbers to select a given option. When the Current Yield option is selected, you are asked to provide the relevant information to perform the calculation.The first question asks for the cost of the bond. This answer should be the price quoted for one bond. You are then asked for the interest rate in percent. If the bond is quoted as paying 10 percent, enter 10 and not 0.1.

You might know the coupon amount, but need to calculate the interest rate. Many bonds come with a par value of $1,000 and the calculation can be done mentally. For example, two $40 semiannual coupons would mean an annual interest payment of $80, which divided by $1,000 equals .08 or 8 percent. For less trivial calculations, the program provides a scratchpad to figure interest rates and commissions. It annoys me to pull out my pocket calculator when using my computer.

To access the scratchpad, enter a negative number such as -1. A negative interest rate is not proper input for these calculations and the program interprets it as a signal to branch to the Scratchpad subroutine. The announcement, "Scratchpad Invoked" appears at the bottom of the screen. You are then asked for a number and an operation. The operations are +, -, *, / and R for addition, subtraction, multiplication, division and return, respectively. Enter the first number. Enter one of the first four operations. Then enter another number. You must then again enter an operation. This cycle is repeated until you enter R for return. When you return to the interest rate question, the last result is automatically carried there, multiplied by 100 and entered in the interest variable.

Next, you are asked for the number of bonds and after that for the par value of each bond. Finally, you are asked for the amount of commission. If you do not know the commission terms, enter 0 as your answer to get a result figured as if there is no commission. If you don't know the amount, but know the commission rate, enter a negative number to call up the scratchpad calculator. The commission is generally figured as so many dollars per bond rather than as a percentage of the par value. From the scratchpad, the last result is entered directly into the commission variable without alteration.

After all the input data is entered, the current yield result is printed and you can decide whether or not to perform another calculation. Press Y to calculate another current yield or press N to return to the menu. If your printer is online, press P to get a screen dump. If printing does not begin after you press P, check the printer status. The program does not call the Print subroutine, so you must again press P after correcting the problem.

The same basic questions are presented for the other three options. For the inverse calculations, you are asked for a percentage current yield or yield to maturity instead of being asked for the purchase price, which is then calculated and displayed after all other

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data is entered. Years to Maturity is one additional item you are asked when dealing with yield to maturity. Enter the number of years between the purchase date and the maturity date. Another item for calculation is Compounding Periods/Years. If interest is paid and compounded annually, enter 1; if semiannually, enter 2. An asterisk (*) before a prompt string indicates you can enter a negative number to invoke the scratchpad calculator.

For example, consider Sam's situation. Sam is considering the purchase of ten $1,000 par value bonds issued by Amalgamated Computer Company. The bonds pay 7 percent interest on a semiannual basis, quoted at $855 and mature in nine years. His broker said that commission on the transaction is $50. After loading and running *Bondcalc*, Sam pressed 1 to evaluate the current yield. He entered 855 as the cost of the bond; 7 for the interest rate; 10 for the number of bonds; 1,000 for the par value; and 50 for the commission. The resulting current yield displayed 8.140 percent.

Sam pressed N to exit the Current Yield section of the program. From the menu he selected 2 to calculate the Yield to Maturity. This time he entered 855 as the cost of the bond; 2 for compounding periods/year; 7 for interest rate; 10 for number of bonds; and 1,000 for par value. Next, he entered 9 for years to maturity and 50 for commission. The answer was 9.333 percent. Note that since the $145 discount is figured in, the Yield to Maturity is over 1 percent higher than the Current Yield. Sam can now compare this rate of return with his other investment options.

As a final note, if you receive an ?OM error, reset the computer, enter PCLEAR1 and run the program again.

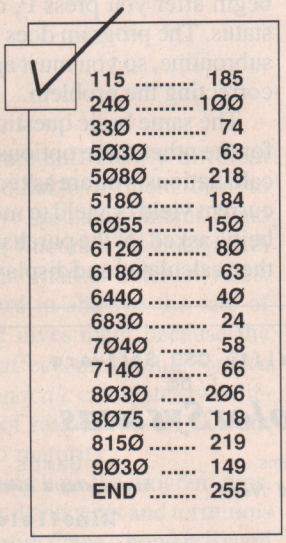
References

Kurtz, M., *Engineering Economics for Professional Engineers' Examinations*, 2nd Ed., McGraw-Hill, New York, 1975

McCready, R., *Business Mathematics*, 4th Ed., Kent Publishing Co., Boston, 1982

❑

32K Extended



```
115 ..... 185
240 ..... 100
330 ..... 74
503Ø ..... 63
508Ø ..... 218
518Ø ..... 184
6Ø55 ..... 15Ø
612Ø ..... 8Ø
618Ø ..... 63
644Ø ..... 4Ø
683Ø ..... 24
7Ø4Ø ..... 58
714Ø ..... 66
8Ø3Ø ..... 2Ø6
8Ø75 ..... 118
815Ø ..... 219
9Ø3Ø ..... 149
END ..... 255
```

The Listing: BONDCALC

```
10 'BONDCALC
20 'WRITTEN BY DALE TINKLEPAUGH
30 'COPYRIGHT FEBRUARY 1991
40 'BY FALSOFT, INC.
50 'RAINBOW MAGAZINE
105 CLEAR 200,16127  'SAVE SPACE
 FOR TEXT DUMP CODE
107 POKE 150,18  'SET PRINTER TO
 2400
108 ' TEXT DUMP ROUTINE
110 DATA &H86,&HFE,&HB7,0,&H6F,&
H8E,4,0,&H5F,&H5C,&HA6,&H80,&H81
,&H60
115 DATA &H2B,2,&H84,&HBF,&HAD,&
H9F,&HA0,2,&HC1,&H20,&H2B,&HEF,&
H86,&H0D
120 DATA &HAD,&H9F,&HA0,2,&H8C,6
,0,&H2B,&HE3,&H7F,0,&H6F,&H39
125 FOR I=16128 TO 16128+40
130 READ A:POKE I,A
135 NEXT I
140 DEFUSR0=&H3F00
202 F2$="#####":F3$="####.###":B
L$="
                                "
205 F1$="$$#######.##":P$="PRESE
NT VALUE IS"
207 'MAIN BODY
210 CLS
230 PRINT@11,"BONDCALC"
235 PRINT@40,"COPYRIGHT 1988"
240 PRINT@70,"BY DALE TINKLEPAUG
H"
250 PRINT@131,"SELECT CONVERSION
 RESULT"
260 PRINT@194,"1 CURRENT YIELD"
270 PRINT@226,"2 YIELD TO MATURI
TY"
280 PRINT@258,"3 PRICE FOR A CUR
RENT YIELD""
290 PRINT@290,"4 PRICE FOR YIELD
 TO MATURITY""
295 PRINT@322,"5 EXIT PROGRAM"
300 PRINT@385,"PRESS A NUMBER BE
TWEEN 1 AND 5"
310 A$=INKEY$:IF A$=""GOTO 310
320 CASE=INSTR(1,"12345",A$)
330 ON CASE GOSUB 5000,6000,7000
,8000,500
340 GOTO 210
500 STOP
600 'END OF MAIN BODY
1140 'CHECK TO SEE IF PRINTER IS
 ON LINE
1150 PR=PEEK(65314):IF INT(PR/2)
=PR/2 THEN QQ=1 ELSE QQ=0
1160 RETURN
5000 'CURRENT YIELD
5010 CLS:PRINT@98,"CURRENT YIELD
"
5020 PRINT" ":INPUT"ENTER COST O
F BOND";CPSH
5030 INPUT"*INTEREST RATE (%)";C
UPN:IF CUPN<0 GOSUB 9000 'TO SCR
ATCHPAD
5032 IF CUPN<0 THEN PRINT@192,BL
$;
5035 IF CUPN<0 THEN CUPN=POP*100
:PRINT@192,"INTEREST RATE= ";CUP
N;" %"
5040 INPUT"NUMBER OF BONDS";NSHR
S
5050 INPUT"PAR VALUE";PAR
5060 INPUT"*COMMISSION";COMM:IF
COMM<0 GOSUB 9000
5062 IF COMM<0 THEN PRINT@288,BL
$;
5065 IF COMM<0 THEN COMM=POP:PRI
NT@288,"COMMISSION= ";COMM
5070 PUPR=CPSH*NSHRS+COMM
5080 DIV=CUPN*PAR*NSHRS/100
5090 CRYLD=DIV/PUPR
5100 PRINT"CURRENT YIELD IS";
5110 PRINTUSING F3$; CRYLD*100;:
PRINT" %"
5120 PRINT"DO ANOTHER? (Y OR N)"
5135 GOSUB 1150
5140 IF QQ=1 THEN PRINT" (PRESS
P TO PRINT OUT SCREEN)";
5150 GOSUB 1150:A$=INKEY$:IF A$=
"" THEN GOTO 5150
5160 IF A$="P" AND QQ=1 THEN A=U
SR0(0)
5170 IF A$="Y" THEN GOTO 5010 EL
SE IFA$="N" THEN RETURN ELSE GOT
O 5150
5180 RETURN
6000 ' YIELD TO MATURITY
6010 ' FIRST GET INPUT DATA AND
6015 ' FIGURE APPROXIMATE SOLUTI
ON
6017 ' BY FORMULA
6030 CLS:PRINT@98,"YIELD TO MATU
RITY"
6040 PRINT" ":INPUT"ENTER COST O
F BOND";CPSH
6045 INPUT"COMPOUNDING PERIODS/Y
EAR";NP
6050 INPUT"*INTEREST RATE (%)";C
UPN:IF CUPN<0 GOSUB 9000
6052 IF CUPN<0 THEN PRINT@224,BL
$;
6055 IF CUPN<0 THEN CUPN=POP*100
:PRINT@224,"INTEREST RATE= ";CUP
N;" %"
6060 INPUT"NUMBER OF BONDS";NSHR
S
6070 INPUT"PAR VALUE";PAR
6080 INPUT"YEARS TO MATURITY";YR
S
6090 INPUT"*COMMISSION";COMM:IF
COMM<0 GOSUB 9000
6092 IF COMM<0 THEN PRINT@352,BL
$;
```

```
6095 IF COMM<Ø THEN COMM=POP:PRI
NT@352,"COMMISSION= ";COMM
6100 DIV=CUPN*PAR*NSHRS/100/NP
6110 API=(PAR*NSHRS+NSHRS*CPSH+C
OMM)/2
6115 'PREMIUM OR DISCOUNT
6120 PORD=CPSH*NSHRS+COMM-PAR*NS
HRS
6130 AYTM=(NP*DIV-PORD/YRS)/API:
GOSUB 6400
6140 PRINT"YIELD TO MATURITY"
6150 PRINTUSING F3$;AYTM*100;:PR
INT" %"
6155 PRINT"DO ANOTHER? (Y OR N)"
6157 GOSUB 1150
6160 IF QQ=1 THEN PRINT" (PRESS
P TO PRINT OUT SCREEN)";
6170 GOSUB 1150:A$=INKEY$:IF A$=
"" THEN GOTO 6170
6175 IF A$="P" AND QQ=1 THEN A=U
SR0(Ø)
6180 IF A$="Y" THEN GOTO 6030 EL
SE IF A$="N" THEN RETURN ELSE GO
TO 6170
6190 RETURN
6400 'PLUG APPROXIMATION INTO FO
RMULA & ITERATE UNTIL WITHIN $.Ø
Ø5
6405 RVAL=PAR*NSHRS:INC=.Ø1:OLDI
R=Ø
6410 FP=(1+AYTM/NP)^(YRS*NP)
6420 FA=(((1+AYTM/NP)^(YRS*NP))-
1)/(AYTM/NP)
6430 FVAL=(CPSH*NSHRS+COMM)*FP-F
A*DIV
6435 'PRINT"INC= ";INC;" DR= ";D
R,"AYTM= ";AYTM;" FVAL= ";FVAL;"
 RVAL= ";RVAL:STOP  'FOR DEBUGGI
NG
6440 IF FVAL>RVAL GOTO 6600
6450 IF FVAL<RVAL GOTO 6800
6460 RETURN '= SO DONE
6600 'APPROXIMATION TOO HIGH
6602 IF ABS(FVAL-RVAL)<.005 THEN
 RETURN
6605 UB=AYTM:DR=-1
6620 IF(DR<>OLDIR)AND (OLDIR<>Ø)
THEN INC=INC/10:IF ABS(INC)<.000
001 THEN RETURN  'CLOSE ENOUGH
6625 AYTM=AYTM-INC
6630 OLDIR=DR:GOTO 6410
6800 'APPROX TOO LOW
6810 IF ABS(FVAL-RVAL)<.005 THEN
 RETURN
6815 LB=AYTM:DR=1
6830 IF(DR<>OLDIR)AND(OLDIR<>Ø)
THEN INC=INC/10:IF ABS(INC)<.000
001 THEN RETURN
6835 AYTM=AYTM+INC
6840 OLDIR=DR:GOTO 6410
7000 'PRICE FOR A CURRENT YIELD
7010 CLS:PRINT@98,"PRICE FOR A C
URRENT YIELD"
7020 PRINT" ":INPUT"DESIRED CURR
ENT YIELD (%)";C:CRYLD=C/100
7030 INPUT"*INTEREST RATE (%)";C
UPN:IF CUPN<Ø GOSUB 9000
7032 IF CUPN<Ø THEN PRINT@192,BL
$
7035 IF CUPN<Ø THEN CUPN=POP*100
:PRINT@192,"INTEREST RATE= ";CUP
N;" %"
7040 INPUT"NUMBER OF BONDS";NSHR
S
7050 INPUT"PAR VALUE";PAR
7060 INPUT"*COMMISSION";COMM:IF
COMM<Ø GOSUB 9000
7062 IF COMM<Ø THEN PRINT@288,BL
$;
7065 IF COMM<Ø THEN PRINT@288,"C
OMMISSION= ";COMM
7070 DIV=CUPN*PAR*NSHRS/100
7080 CPSH=(DIV/CRYLD-COMM)/NSHRS
7090 PRINT"PRICE PER SHARE IS"
7100 PRINTUSING F1$;CPSH
7120 PRINT"DO ANOTHER? (Y OR N)"
7125 GOSUB 1150
7130 IF QQ=1 THEN PRINT" (PRESS
P TO PRINT OUT SCREEN)";
7140 GOSUB 1150:A$=INKEY$:IF A$=
"" THEN GOTO 7140
7150 IF A$="P" AND QQ=1 THEN A=U
SR0(Ø)
7160 IF A$="Y" THEN GOTO 7010 EL
SE IF A$="N" THEN RETURN ELSE GO
TO 7140
7170 RETURN
8000 'PRICE FOR A YIELD TO MATUR
ITY
8010 CLS:PRINT@98,"PRICE FOR YIE
LD TO MATURITY"
8015 PRINT" ":INPUT"COMPOUNDING
PERIODS/YEAR";NP
8020 INPUT"YIELD TO MATURITY (%)
";Y:YTM=Y/100/NP
8030 INPUT"*INTEREST RATE (%)";C
UPN:IF CUPN<Ø GOSUB 9000
8032 IF CUPN<Ø THEN PRINT@224,BL
$;
8035 IF CUPN<Ø THEN CUPN=POP*100
:PRINT@224,"INTEREST RATE= ";CUP
```

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```
N;" %"
8040 INPUT"NUMBER OF BONDS";NSHR
S
8050 INPUT"PAR VALUE";PAR
8060 INPUT"YEARS TO MATURITY";YR
S
8070 INPUT"*COMMISSION";COMM:IF
COMM<0 GOSUB 9000
8072 IF COMM<0 THEN PRINT@352,BL
$;
8075 IF COMM<0 THEN COMM=POP:PRI
NT@352,"COMMISSION= ";COMM
8080 DIV=CUPN*PAR*NSHRS/100/NP
8090 FP=(1+YTM)^(YRS*NP) 'FUTURE
 VALUE OF PRESENT SUM FACTOR
8100 FA=(((1+YTM)^(YRS*NP))-1)/Y
TM  'FUTURE VALUE OF UNIFORM SER
IES FACTOR
8110 CPSH=(((PAR*NSHRS+FA*DIV)/F
P)-COMM)/NSHRS
8115 PRINT"PRICE/BOND"
8120 PRINTUSING F1$;CPSH
8130 PRINT"DO ANOTHER? (Y OR N)"
8135 GOSUB 1150
8140 IF QQ=1 THEN PRINT"(PRESS P
 TO PRINT OUT SCREEN)";
8150 GOSUB 1150:A$=INKEY$:IF A$=
" " THEN GOTO 8150
8155 IF A$="P" AND QQ=1 THEN A=U
SR0(0)
8160 IF A$="Y" THEN GOTO 8010 EL
SE IF A$="N" THEN RETURN ELSE GO
TO 8150
8170 RETURN
9000 'SCRATCH PAD
9010 PRINT@384,"SCRATCH PAD INVO
KED"
9015 PRINT@416,"";:INPUT"ENTER N
UMBER  ";POP
9017 PRINT@448,BL$;
9020 PRINT@448,"ENTER OPERATION
(+-*/R)";
9030 B$=INKEY$:IF B$="" GOTO 903
0
9040 CASE=INSTR(1,"+-*/R",B$):IF
 CASE=0 GOTO 9030
9045 IF CASE=5 THEN PRINT@384,BL
$;:PRINT@416,BL$;:PRINT@448,BL$;
:PRINT@480,BL$;: RETURN
9055 PRINT@448,BL$;:PRINT@448,B$
;" ";:INPUT"ENTER NUMBER";NUM
9060 ON CASE GOTO 9100,9200,9300
,9400,9500
9100 POP=POP+NUM:PRINT@416,BL$;:
PRINT@431,POP;:GOTO 9020
9200 POP=POP-NUM:PRINT@416,BL$;:
PRINT@431,POP;:GOTO 9020
9300 POP=POP*NUM:PRINT@416,BL$;:
PRINT@431,POP;:GOTO 9020
9400 POP=POP/NUM:PRINT@416,BL$;:
PRINT@431,POP;:GOTO 9020
9500 RETURN
```

Utility 16K Extended

Novices Niche

Timer

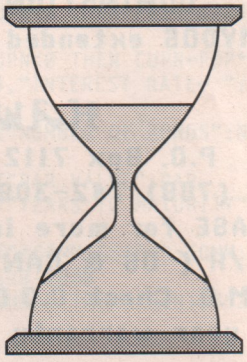
by Richard Larson

This is a timer program. It counts down from a time determined by the user. It also functions as a rudimentary stopwatch by counting elapsed time.

The program uses the TIMER function of Extended BASIC. The timer is set to zero. Every time it reaches 60, variable SS (seconds) is incremented. When SS reaches 60, MM (minutes) is incremented. The program can easily be customized to suit individual needs.

The Listing: TIMER

```
1 'TIMER
2 'WRITTEN BY RICHARD LARSON
3 'COPYRIGHT FEBRUARY 1991
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 MM=0:SS=0:CLS:PRINT"TIMER PRO
GRAM"
20 PRINT"1> COUNT DOWN
        2> ELAPSED TIME"
30 INPUTA$
40 IF A$="1" THEN 50 ELSE IF A$=
"2" THEN 180 ELSE 30
50 INPUT"ENTER MINUTES";M
60 INPUT"ENTER SECONDS";S
70 IF S>59 THEN 60
80 TIMER=0
90 IF MM=M AND SS=S THEN GOTO 15
0
100 SS=INT(TIMER/60)
110 IF SS>59 THEN MM=MM+1: GOTO
80
120 PRINT@32*9,"SECONDS: ";SS
130 PRINT@32*8,"MINUTES: ";MM
140 GOTO 90
150 SOUND100,1:PRINT@32*11,"TIME
'S UP"
160 INPUT"AGAIN Y/N";X$:IF X$="Y
" THEN 10 ELSE END
170 GOTO 10
180 CLS:MM=0:PRINT@10,"TIME ELAP
SED"
190 PRINT@32,"PRESS ANY KEY TO S
TART"
200 IF INKEY$="" THEN 200
210 PRINT@32,"TIMER STARTED - AN
Y KEY TO STOP"
220 TIMER=0
230 SS=INT(TIMER/60)
240 IF SS>59 THEN MM=MM+1:SS=0:G
OTO 220
250 PRINT@200,MM;":";SS
260 IF INKEY$="" THEN 230 ELSE 2
70
270 PRINT"ELAPSED TIME = ";MM;"M
INUTES";SS;"SECONDS"
```



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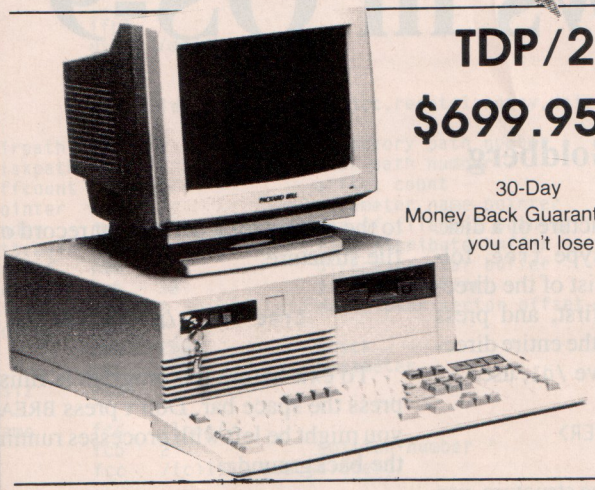

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Branching out to monitor directory growth

A Tree Grows in OS-9

by Stephen B. Goldberg

Many people use computers to help organize their work or home needs. And computers handle this task efficiently. But how efficient is the system if we don't know what's on it? How do you see the contents of an *entire* OS-9 disk? I used to execute `dir` for the root directory and then repeat `dir` for each subdirectory. I also used `dir` for deeper subdirectories if they existed. Now I use *Tree*.

Tree is a program that displays the names of all the files on a disk, with graphics depicting the directory tree on a text screen. *Tree* can also be used to display a selected portion of the directory structure of a disk.

To start the program, type `tree`, followed by the name or pathlist of the directory you want displayed first, and press ENTER. For example, to see the entire directory tree on the disk in Drive `/d1`, use

```
tree /d1 <ENTER>
```

To see only part of the tree structure, use a command line such as

```
tree /d1/recipes <ENTER>
```

Part of the resulting display is shown in Figure 1. As you can see, each subdirectory is indicated by a double asterisk (**) preceding the name. The subdirectory's filenames are offset to the right. The program's standard output path can be redirected to another file or to the printer for a permanent record of the file structure:

```
tree /d1 >/p <ENTER>
```

To exit before the program is finished, press the space bar. Don't press BREAK or you might be left with processes running in the background.

The Program

Tree opens the directory indicated on the command line. It then reads and displays each filename found. It reads the attribute byte in the file descriptor to see if the entry is a subdirectory. If the file is not a subdirectory, the program continues to read and display filenames to the end of the directory. If an entry is a subdirectory, the program executes itself again using the subdirectory name as the parameter. This process is called *recursion*. When the subdirectory has been completely displayed, this new process is terminated and the program returns to its original format and continues to display any further entries.

If you don't have the OS-9 assembler, enter and run Listing 2. This BASIC09 program generates the executable file for *Tree*. ❑

Stephen Goldberg is a dentist and the author of the Utilipak series of OS-9 utilities. He can be contacted at 695 Plainview Road, Bethpage, NY 11714. Please include an SASE when requesting a reply.

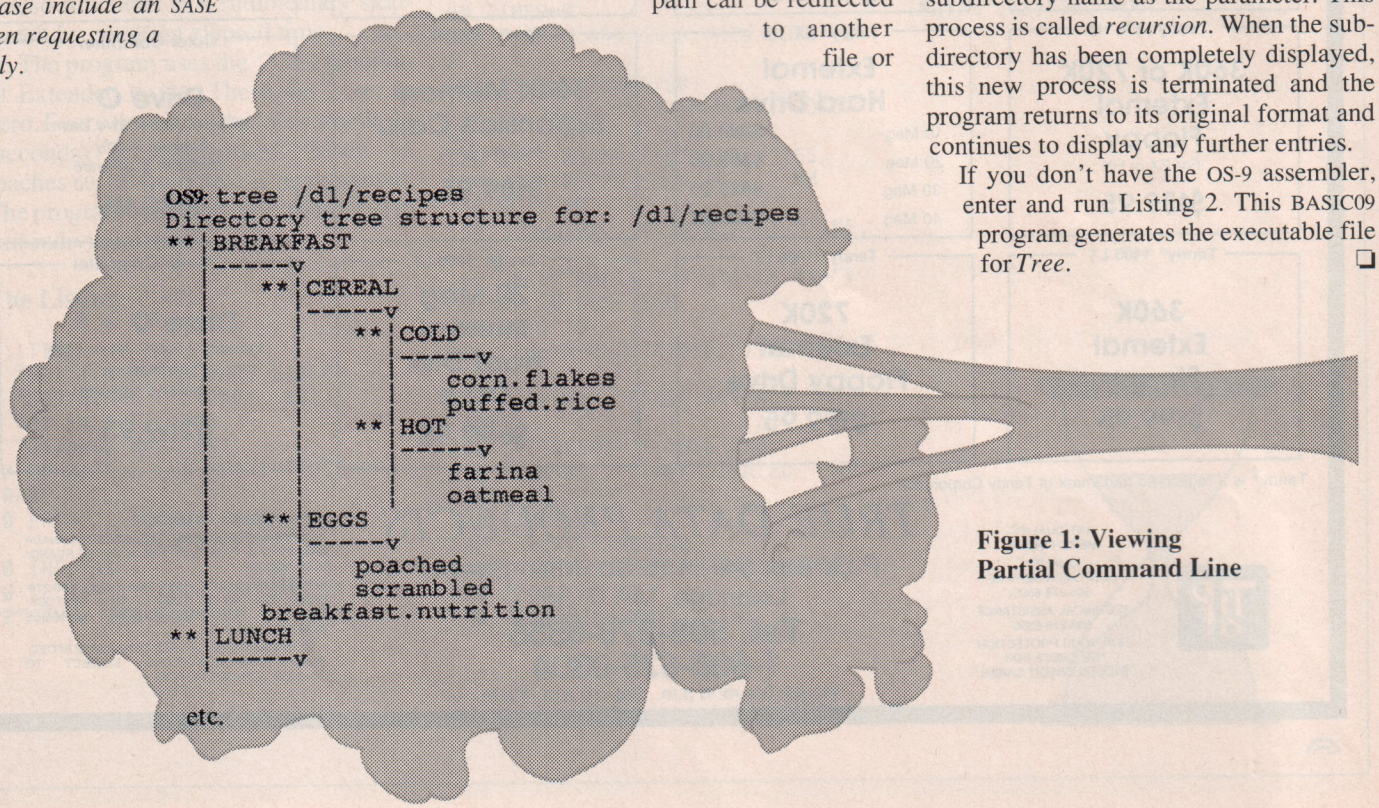

Figure 1: Viewing Partial Command Line

Listing 1: Tree.asm

```
*************************************************
*
* TREE  -  (c) 1989 by STEPHEN B. GOLDBERG
*
* Use: tree <start_directory>
*      display directory tree
*      hit <SPACE> to exit program
*
         ifp1
         use   /dd/defs/os9defs
         endc
*
         mod   len,name,prgrm+objct,reent+1,entry,dsiz
*
dirpath  rmb   1              directory path number
diskpath rmb   1              disk path number
offcount rmb   1              offset count
pointer  rmb   2              parameter name pointer
ender    rmb   2              end of filename pointer
attrbuf  rmb   1              file attribute buffer
prebuf   rmb   3              directory star buffer
buffer   rmb   30             filename buffer
hiseek   rmb   2              descriptor sector offset
loseek   rmb   2
         rmb   200            stack
         rmb   200            parameter
dsiz     equ   .
*
name     fcs   /Tree/
         fcb   2              edition number
         fcc   /(c)1989 S.B.Goldberg/
*
header   fcc   /Directory tree structure for: /
headlen  equ   *-header
dot      fcs   /./            current directory
at       fcs   /@/            entire disk
*****************************
* INITIALIZE
*****************************
entry    decb                 parameter?
         lbeq  syntax         no, prompt and quit
         stx   pointer        save parameter pointer
         clr   offcount       zero offset count
         clr   1+loseek       zero lsb descriptor offset
         clr   attrbuf        clear attribute buffer
         ldd   #$2a7c         *|
         sta   prebuf         initialize subdirectory
         std   1+prebuf       star indicator
findend  ldd   ,x+            parameter characters
         cmpa  #$20           end of parameter?
         bhi   findend        no, look again
         tsta                 yes, forked process?
         bne   setend         no, terminate directory name
         stb   offcount       save offset count
setend   lda   #$0d           carriage return
         sta   -1,x           to end of directory name
         ldx   pointer        parameter pointer
         lda   #read.         read mode
         os9   i$chgdir       change directory
         bcs   cantopen       message and quit on error
         leax  <dot,pcr       current directory (.)
         lda   #read.+dir.    read directory mode
         os9   i$open         open the directory
cantopen lbcs  cant           message and quit on error
         sta   dirpath        save directory path number
         leax  <at,pcr        entire disk
         os9   i$open         open disk
         bcs   passerr1       exit with error
         sta   diskpath       save disk path number
         ldb   offcount       subdirectory offset?
```


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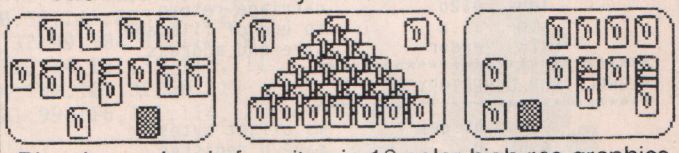

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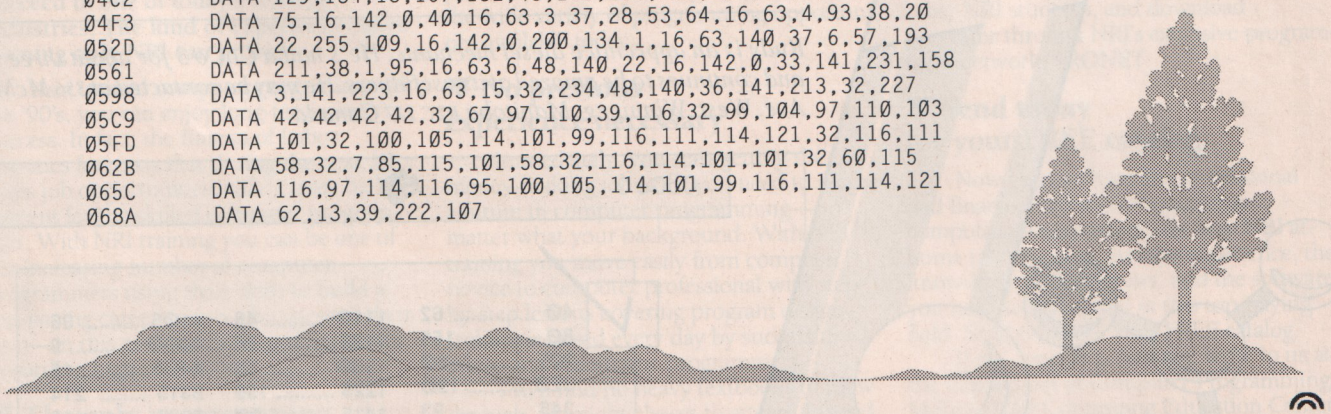
```
         bne   doarrow       yes, display subdirectory arrow
         leax  <header,pcr   no, header message
         ldy   #headlen      message length
         lbsr  print1        message to screen
         ldx   pointer       parameter pointer
         bra   passname      directory name to screen
*
arrow    fcc   /  |-----v/   subdirectory arrow offset
         fcb   $0d
offset   fcc   /   |   /     filename offset
offlen   equ   *-offset
*
doarrow  decb                subtract arrow offset
         bsr   dooffset      add any additional offset
         leax  <arrow,pcr    arrow display
passname bra   doname        to screen
*
dooffset leax  <offset,pcr   offset address
         ldy   #offlen       offset length
offloop  decb                display offset?
         bmi   back          no, return
         lbsr  print1        yes, offset to screen
         bra   offloop       check for more offset
back     rts                 return
*******************************
* GET FILENAME
*******************************
read     ldd   #$27          keysense function
         os9   i$getstt      check for keypress
         tsta                <SPACE> pressed?
         lbmi  noerr         yes, quit tree
         leax  buffer,u      filename buffer
         ldy   #29           maximum filname length
         lda   dirpath       directory path number
         os9   i$read        get filename
         lbcs  error         branch on error
         leax  hiseek,u      descriptor offset buffer
         ldy   #3            three descrip. offset bytes
         os9   i$read        get them
passerr1 bcs   passerr2      exit with error
         leax  buffer,u      start of filename
         lda   ,x            filename character
         anda  #$7f          clear ms bit
         cmpa  #'A           valid filename?
         blo   read          no, get next entry
lastloop lda   ,x+           last character?
         bpl   lastloop      no, look again
         anda  #$7f          yes, clear ms bit
         ldb   #$0d          carriage return
         std   -1,x          to end of filename
         stx   ender         save end address
*******************************
* CHECK FOR DIRECTORY
*******************************
         ldx   hiseek        ms offset bytes
         pshs  u             save U register
         ldu   loseek        ls offset bytes
         lda   diskpath      disk path number
         os9   i$seek        find descriptor sector
passerr2 bcs   passerr3      exit with error
         puls  u             retrieve U register
         ldy   #1            one byte
         leax  attrbuf,u     attribute buffer
         os9   i$read        get attribute byte
         bcs   passerr3      exit with error
*******************************
* DISPLAY FILENAME
*******************************
         ldb   offcount      offset count
         bsr   dooffset      offset to screen
         leax  buffer,u      buffer address
         tst   attrbuf       directory?
         bpl   doname        no, just display filename
         leax  -3,x          yes, display stars
doname   bsr   print         filename to screen
         tst   attrbuf       directory?
         bpl   read          no, get next filename
*******************************
* RE-EXECUTE TREE IF DIRECTORY
*******************************
         ldx   ender         end of directory name
         clra                fork flag
         ldb   offcount      get offset
         incb                add 1 to offset
         std   ,x++          to end of pathlist
         lda   #$0d          terminator
         sta   ,x            terminate new parameter
         leax  name,pcr      program name (Tree)
         ldd   #$1101        type/lang and data size
         pshs  u             save U register
         leau  buffer,u      parameter buffer
         ldy   #40           maximum parameter length
         os9   f$fork        fork to Tree again
passerr3 bcs   out           exit with error
         puls  u             retrieve U register
         os9   f$wait        wait till done
         tstb                error passed?
         bne   out           yes, exit with error
         lbra  read          no, get next entry
*
print    ldy   #200          maximum length
print1   lda   #1            standard output path
         os9   i$writln      to screen
         bcs   out           exit with error
         rts                 return
*******************************
* ERROR MESSAGES
*******************************
error    cmpb  #e$eof        end of file?
         bne   out           exit with other error
noerr    clrb                clear error flag
out      os9   f$exit        quit
*
cant     leax  <nodir,pcr    can't find message
         ldy   #nodirlen     length of message
         bsr   print1        message to screen
         ldx   pointer       parameter pointer
         bsr   print         directory name to screen
         os9   f$perr        print error
         bra   noerr         quit
*
syntax   leax  <sprompt,pcr  syntax prompt
         bsr   print         to screen
         bra   noerr         quit
*
nodir    fcc   /**** Can't change directory to: /
sprompt  fcb   7
nodirlen equ   *-nodir
         fcc   "Use: tree <start_directory>"
         fcb   $0d
*
         emod
len      equ   *
         end
```

Listing 2: MakeTree.b09

```
PROCEDURE MakeTree
 0000       (* Generates the binary module tree *)
 0026       (* Level I - change all /dd to /d0 *)
 004B       DIM path,byt:BYTE
 0056       DIM count:INTEGER
 005D       PRINT "Creating tree . . .";
 0075       CREATE #path,"/dd/cmds/tree":WRITE
 008D       FOR count=1 TO 452
 009E         READ byt
 00A3         PUT #path,byt
 00AD       NEXT count
 00B8       CLOSE #path
 00BE       PRINT
 00C0       SHELL "attr /dd/cmds/tree e pe"
 00DB       END
 00DD       DATA 135,205,1,196,0,13,17,129,237,0,70,1,189,84,114,101
 0111       DATA 229,2,40,99,41,49,57,56,57,32,83,46,66,46,71,111,108
 0148       DATA 100,98,101,114,103,68,105,114,101,99,116,111,114,121
 0176       DATA 32,116,114,101,101,32,115,116,114,117,99,116,117,114
 01A4       DATA 101,32,102,111,114,58,32,174,192,90,16,39,1,50,159
 01D5       DATA 3,15,2,15,44,15,7,204,42,124,151,8,221,9,236,128,129
 020C       DATA 32,34,250,77,38,2,215,2,134,13,167,31,158,3,134,1,16
 0243       DATA 63,134,37,8,48,140,207,134,129,16,63,132,16,37,0,237
 0277       DATA 151,0,48,140,194,16,63,132,37,96,151,1,214,2,38,30
 02AB       DATA 48,140,149,16,142,0,30,23,0,195,158,3,32,22,32,32,124
 02E2       DATA 45,45,45,45,45,118,13,32,32,124,32,32,32,90,141,5,48
 0319       DATA 140,234,32,114,48,140,239,16,142,0,6,90,43,5,23,0,154
 0350       DATA 32,248,57,204,0,39,16,63,141,77,16,43,0,152,48,75,16
 0387       DATA 142,0,29,150,0,16,63,137,16,37,0,133,48,200,41,16,142
 03BE       DATA 0,3,16,63,137,37,33,48,75,166,132,132,127,129,65,37
 03F2       DATA 208,166,128,42,252,132,127,198,13,237,31,159,5,158
 0420       DATA 41,52,64,222,43,150,1,16,63,136,37,61,53,64,16,142
 0454       DATA 0,1,48,71,16,63,137,37,48,214,2,141,150,48,75,13,7
 048B       DATA 42,2,48,29,141,47,13,7,42,152,158,5,79,214,2,92,237
 04C2       DATA 129,134,13,167,132,48,141,254,209,204,17,1,52,64,51
 04F3       DATA 75,16,142,0,40,16,63,3,37,28,53,64,16,63,4,93,38,20
 052D       DATA 22,255,109,16,142,0,200,134,1,16,63,140,37,6,57,193
 0561       DATA 211,38,1,95,16,63,6,48,140,22,16,142,0,33,141,231,158
 0598       DATA 3,141,223,16,63,15,32,234,48,140,36,141,213,32,227
 05C9       DATA 42,42,42,42,32,67,97,110,39,116,32,99,104,97,110,103
 05FD       DATA 101,32,100,105,114,101,99,116,111,114,121,32,116,111
 062B       DATA 58,32,7,85,115,101,58,32,116,114,101,101,32,60,115
 065C       DATA 116,97,114,116,95,100,105,114,101,99,116,111,114,121
 068A       DATA 62,13,39,222,107
```



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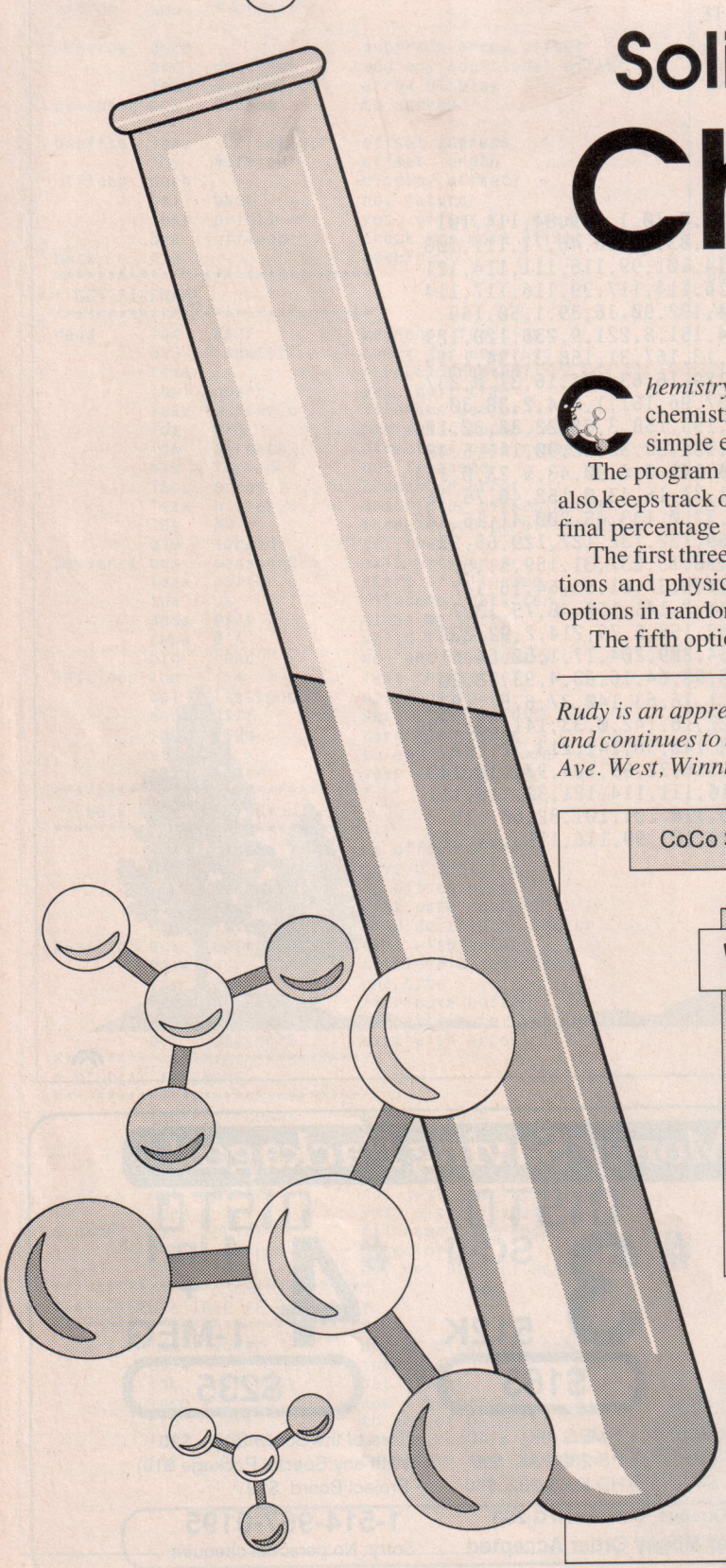
The right mix for learning chemistry

Solid Foundation in Chemistry

by Rudy Meijering



Chemistry Tutor is a program that helps in learning the very basics of chemistry — chemical spelling, abbreviations, physical properties and simple equation balancing.

The program has many options, such as the ability to print question results. It also keeps track of the number of questions, errors, number of tries per question and final percentage ratings.

The first three options are for selected areas of questioning (spelling, abbreviations and physical properties). The fourth option combines all three previous options in random order.

The fifth option is used for equation balancing. This option includes a hint op-

---

Rudy is an apprentice diesel mechanic. He's had a CoCo 3 for about three years and continues to be amazed at its usefulness. He may be contacted at 356 McMeans Ave. West, Winnipeg, Manitoba R2C 1J7 Canada.

CoCo 3

```
4Ø ..... 62      111Ø ..... 45     41Ø5 ..... 36
8Ø ..... 155     1125 ..... 34     43ØØ ..... 9
225 ..... 8Ø     115Ø ..... 58     44Ø5 ..... 16
32Ø ..... 19Ø    1225 ..... 156    9315 ..... 214
345 ..... 93     1415 ..... 1ØØ    9385 ..... 115
43Ø ..... 151    15Ø5 ..... 156    946Ø ..... 45
525 ..... 182    162Ø ..... 121    952Ø ..... 183
55Ø ..... 155    18Ø5 ..... 62     9585 ..... 8Ø
57Ø ..... 73     31ØØ ..... 94     9635 ..... 144
6ØØ ..... 184    321Ø ..... 24Ø    971Ø ..... 229
71Ø ..... 168    342Ø ..... 233    9775 ..... 194
8Ø5 ..... 79     37ØØ ..... 54     9815 ..... 231
92Ø ..... 243    382Ø ..... 51     END ..... 165
```

The Listing: CHETUTOR

```
Ø 'COPYRIGHT 199Ø FALSOFT, INC.
5 REM  ************************
*******
1Ø REM ***
    ***
15 REM *** CHEMISTRY PERIODIC TA
BLE ***
```

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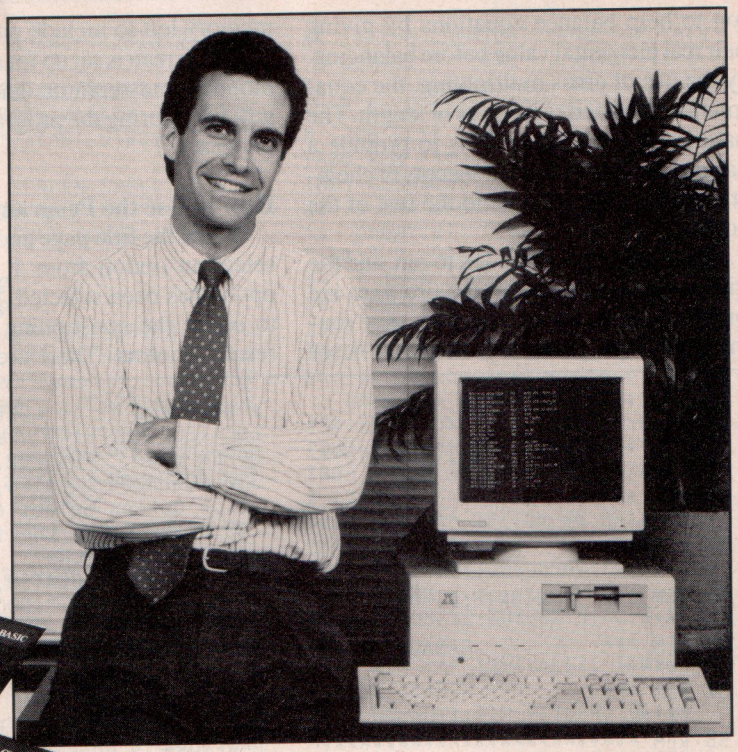

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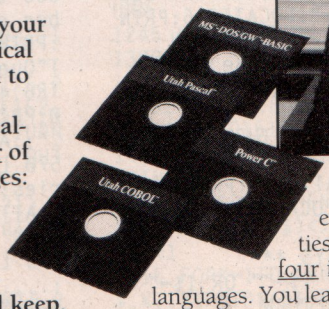

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tion to help balance equations by giving their real elemental value before balancing. By the use of cross multiplying, the equations are balanced regardless of length. The main idea of the program is to provide a learning aid for the basic concepts of chemistry and how they relate to the rest of the world.

The program requires 32K to run, and the printer codes included in the program are for the DMP-105. There is no disk save routine in the program, but there is 9K of memory left to include one if you wish.

The screen is set up for a green-on-black monochrone monitor, and screen widths will vary during the program error printout (40 to 80).

How to Use the Program

When the title page and options appear, select an option from 1 to 5. When the option has been selected, you are required to select the questioning format and the results printout. There are many different levels of questions. Once you have mastered one level, you can move to the next level.

The program is very straightforward and user friendly, so not much is really needed — except for response to equation balancing. When answering the questions, your answer is not subscripted. But do not worry; the computer has already taken this into account. If you make a mistake, use the left arrow key to backspace over your mistake and type in the correction. ❑

```
20 REM ***
   ***
25 REM ********** WRITTEN BY **
*******
30 REM ***
   ***
35 REM ***       R.G. MEIJERING
   ***
40 REM ***     WINNIPEG, MANITOBA
   ***
45 REM ***           CANADA
   ***
50 REM ***
   ***
55 REM ************************
*******
60 REM ***
   ***
65 REM ***         COPY RIGHT
   ***
70 REM ***
   ***
75 REM ***       APRIL 18th, 1989
   ***
80 REM ***
   ***
85 REM ************************
*******
100 REM *** INITIAL SCREEN & MEM
ORY ***
105 POKE65497,0:WIDTH40:CLEAR200
0:PALETTE0,0:CLS1:PALETTE8,48:CL
S1:RUN1600
200 REM *** SCREEN PROMPTS LINE
LOCATIONS ***
205 C1=7:R1=0:R2=1:GOSUB305:RETU
RN
210 C1=21:R1=0:R2=1:GOSUB305:RET
URN
215 C1=5:R1=22:GOSUB310:RETURN
220 C1=14:R1=22:GOSUB310:RETURN
225 C1=0:R1=19:C2=8:R2=20:GOSUB3
25:RETURN
230 C1=0:R1=10:C2=8:R2=11:GOSUB3
25:RETURN
300 REM *** SCREEN PROMPTS ***
305 CLS1:LOCATEC1,R1:ATTR0,0:PRI
NT"Chemistry Periodic Table":LOC
ATEC1,R2:PRINT"----------------
-------":RETURN
310 LOCATEC1,R1:PRINT"Press any
key to Continue.";:GOSUB400:RETU
RN
315 LOCATE0,22:PRINT"Press [ C ]
 - Continue or [ M ] - Menu";:GO
SUB400:IF I$="C" THEN RETURN:ELS
E IF I$="M" THEN 1600:ELSE IF I$
<>"C" OR I$<>"M" THEN 315
320 LOCATE0,22:PRINT"[ C ] conti
nue  [ E ] exit  [ R ] re-do";:G
OSUB400:IF I$="C" OR I$="E" OR I
$="R" THENRETURNELSE320
325 LOCATEC1,R1:PRINT"  NOTE: th
e keyboard is in LOWER case...":
LOCATEC2,R2:PRINT"Use SHIFT for
UPPER case.":POKE282,0:RETURN
330 GOSUB205:LOCATE5,3:PRINT"Que
stion Option Selection:":LOCATE5
,10:PRINT"Enter the following:":
LOCATE0,12:RETURN
335 GOSUB205:LOCATE0,5:PRINT"Equ
ation Balancing:":LOCATE0,6:PRIN
T"-----------------":RETURN
340 LOCATE0,10:PRINT"One minute
Please...To set up Questions":RE
TURN
345 IF FA=1 OR FA=4 THEN 350 ELS
E RETURN
350 LOCATE0,13:ATTR6,4:PRINT" HI
NT: ";:ATTR0,0:LOCATE0,15:PRINTH
I$:RETURN
400 REM *** INKEYS ***
405 I$=INKEY$:IF I$="" OR I$=" "
 THEN 405 ELSE RETURN
410 GOSUB405:I=VAL(I$):IF I<1 OR
 I>7 THEN 410 ELSE RETURN
415 GOSUB405:IF I$="Y" OR I$="N"
 THEN420ELSE415
420 IF I$="Y" THEN IN$=" Yes ":I
N=1:RETURN
425 IF I$="N" THEN IN$=" No  ":I
N=2:RETURN
430 LOCATE0,8:LINEINPUT"Your Ans
wer: ";W$:RETURN
435 LOCATE0,17:LINEINPUT"Answer:
 ";W$:RETURN
500 REM *** QUESTIONS OPTIONS **
*
505 GOSUB520:GOSUB525:GOSUB540:G
OSUB545:GOSUB550:GOTO555
510 GOSUB520:GOSUB525:GOSUB540:G
OSUB545:GOTO555
515 GOSUB520:LE=3:GOSUB530:GOSUB
535:GOSUB545:GOTO555
520 GOSUB330:INPUT"Number of Que
stions [ 25 - 106 ]";NQ:IF NQ<25
 OR NQ>106 THEN 520 ELSE RETURN
525 IF NQ=>25 AND NQ<27 THEN LE=
4:ELSE IF NQ>26 AND NQ<54 THEN L
E=3:ELSE IF NQ>54 AND NQ<79 THEN
 LE=2:ELSE IF NQ>79 THEN LE=1
530 IF LE=1 THEN540ELSE GOSUB330
:PRINT"Level of Questions [ 1 -
";LE;" ]";:INPUT"";QL:IF QL>0 OR
 QL<(LE+1) THENRETURNELSE530
535 GOSUB330:INPUT"Number of Che
m. / Quest. [ 2 - 8 ] ";EN:IF EN
<2 OR EN>8 THEN 535
540 GOSUB330:INPUT"Number of Tri
es / Question [ 1 - 5 ]";NT:IF N
T<1 OR NT>5 THEN540ELSERETURN
545 GOSUB330:PRINT"List Errors [
 Yes / No ]? ";:GOSUB415:LE$=IN$
:LO=IN:RETURN
550 GOSUB330:PRINT"List Spelling
 Errors [ Yes / No ]? ";:GOSUB41
5:SP$=IN$:SP=IN:RETURN
555 GOSUB330:PRINT"Give Percenta
ge Rating [ Yes / No ]? ";:GOSUB
415:GP$=IN$:GP=IN
560 GOSUB330:PRINT"Print - Out R
equired [ Yes / No ]? ";:GOSUB41
5:PO$=IN$:PO=IN
565 GOSUB330:LOCATE0,6:PRINT"Num
ber of Questions:.....";:ATTR6,4
:PRINTNQ;:ATTR0,0:LOCATE0,8:PRIN
T"Question Level:.........";:AT
TR6,4:PRINTQL;:ATTR0,0:LOCATE0,1
0:PRINT"Number of Chem. / Quest:
.";:ATTR6,4:PRINTEN;:ATTR0,0
570 LOCATE0,12:PRINT"Number of T
ries:.........";:ATTR6,4:PRINTNT
;:ATTR0,0:IF SP$="" THEN SP$=" N
o  "
575 LOCATE0,14:PRINT"List Errors
:.............";:ATTR6,4:PRINTLE
$;:ATTR0,0:LOCATE0,16:PRINT"List
 Spelling Errors:....";:ATTR6,4:
PRINTSP$;:ATTR0,0:LOCATE0,18:PRI
NT"Give Percentage:.........";:A
TTR6,4:PRINTGP$;:ATTR0,0
580 LOCATE0,20:PRINT"Print - Out
:.............";:ATTR6,4:PRINTPO
$;:ATTR0,0:GOSUB320:IF I$="C" TH
EN585:ELSE IF I$="E" THEN 1600:E
LSE IF I$="R" THEN ON I GOTO 505
,510,510,505,515
585 IF I>4 THEN 3000
600 REM *** INITIALIZE QUESTION
OPTION VARIABLES ***
605 NS=NQ+1:DIM QT(NS):DIM TE$(N
S):DIM SE$(NS):DIM QS(NS):TR=1
610 IF NQ<27 THEN SL=(QL-1)*26 E
LSE SL=INT((26.5)*(QL-1))
615 RESTORE:FORZ=0TO(SL-1):READA
,B$,C$,D$,E:NEXTZ:GOSUB205:GOSUB
230:GOSUB215:NN=NQ+SL
620 FORT=SL TO NN:READA,B$,C$,D$
,E:ON I GOSUB 1700,1800,1900,200
0,815,915:NEXTT:RESTORE:GOSUB215
700 REM *** PERCENTAGE ROUTINE *
**
705 GOSUB205:GOSUB1000:IF GP=1 T
HEN710ELSE800
710 RA=RA-1:PE=INT((100/NQ)*RA):
LOCATE0,3:PRINT"Percentage Ratin
g:";:LOCATE0,4:PRINT"**********
******";:LOCATE5,6:PRINT"Number
Right:........ ";RA;:LOCATE5,8:P
RINT"Your Percentage:..... ";PE;
"%";:IF NT=1 THEN 720 ELSE 715
715 PA=INT((100/NQ)*(RA-AT)):LOC
ATE0,11:PRINT"Actual Percentage
Rating:";:LOCATE0,12:PRINT"*****
******************";:LOCATE5,14
:PRINT"Number of Attemps:.... ";
AT;:LOCATE5,16:PRINT"Final Perce
ntage Rating:.. ";PA;"%";:
720 IF PO=1 AND NT<2 THEN GOSUB1
```

```
110:ELSE IF PO=1 AND NT>1 THEN G
OSUB 1120
725 IF FG=2 THEN RETURN
730 GOSUB215
800 REM *** ERROR PRINT - OUT RO
UTINE ***
805 GOSUB1000:IF LO=1 AND ER>0 T
HEN 810 ELSE 900
810 I=5:Z=1:X=1:SL=1:EP=1:NN=105
:GOTO1200
815 IF QT(EP)=A THEN 1225 ELSE R
ETURN
820 LOCATE56,LT:PRINTTE$(EP):EP=
EP+1:GOTO 1230
900 REM *** SPELLING ERROR PRINT
 - OUT ROUTINE ***
905 GOSUB1000:IF SP=1 AND SW>0 T
HEN 910 ELSE 100
910 I=6:Z=2:ER=SW:X=2:SL=1:NN=10
5:EP=1:GOTO1200
915 IF QS(EP)=A THEN 1225 ELSE R
ETURN
920 LOCATE56,LT:PRINTSE$(EP):EP=
EP+1:GOTO 1230
1000 REM *** PAPER PRINT - OUT I
NITIAL ROUTINE ***
1005 POKE65496,0:POKE65497,126:P
OKE65496,126:POKE150,18:POKE152,
64:POKE155,80:POKE282,255:RETURN
1100 REM *** PRINTER PRINT - OUT
 ***
1105 PRINT#-2:PRINT#-2,TAB(21),"
Chemistry Periodic Table":PRINT#
-2,TAB(21),"--------------------
----":PRINT#-2:RETURN
1110 GOSUB1105:PRINT#-2:PRINT#-2
,TAB(5)"Percentage Rating:":PRIN
T#-2,TAB(5)"*****************":P
RINT#-2:PRINT#-2:PRINT#-2,TAB(5)
"Number of Questions:.........
...";NQ:PRINT#-2:PRINT#-2,TAB(5)
"Question Level:..............
...";QL:PRINT#-2
1115 PRINT#-2,TAB(5)"Number of T
ries / Question:.......";NT:PRIN
T#-2:PRINT#-2,TAB(5)"Number Corr
ect:..................";RA:PRIN
T#-2:PRINT#-2,TAB(10)"Your Perce
ntage Rating:.........";PE;"%":
PRINT#-2:RETURN
1120 GOSUB1110:PRINT#-2,TAB(5)"A
ctual Perecentage Rating:":PRINT
#-2,TAB(5)"*********************
****":PRINT#-2:PRINT#-2:PRINT#-2
,TAB(5)"Number of Attempts:.....
.........";AT:PRINT#-2:PRINT#-2,
TAB(20)"Final Perecentage Rating
:.....";PA;"%":PRINT#-2:RETURN
1125 PRINT#-2:PRINT#-2,TAB(5)"Er
ror Listing:":PRINT#-2,TAB(5)"**
**********":PRINT#-2:PRINT#-2:R
ETURN
1130 PRINT#-2:PRINT#-2,TAB(5)"Sp
elling Error Listing:":PRINT#-2,
TAB(5)"**********************":P
RINT#-2:RETURN
1135 ON Z GOSUB1125,1130:PRINT#-
2:PRINT#-2,TAB(5)"Chemical Name"
;TAB(22)"Symbol";TAB(39)"State";
TAB(56)"Your Mistake":PRINT#-2:P
RINT#-2:RETURN
1140 IF Z=1 THEN O$=TE$(EP) ELSE
 O$=SE$(EP)
1145 PRINT#-2,TAB(5)B$;TAB(24)C$
;TAB(39)D$;TAB(57)O$:RETURN
1150 PRINT#-2,TAB(3)"Chemical Eq
uation";TAB(31)"Correct Answer";
TAB(61)"Your Answer":PRINT#-2:RE
TURN
1155 PRINT#-2,TAB(C3)QN$(T);TAB(
C4)RB$(T);TAB(C5)WA$(T):PRINT#-2
,TAB(C4)RC$(T);TAB(C5)WB$(T):RET
URN
1200 REM *** SCREEN SPELLING & E
RROR PRINT OUT ROUTINE ***
1205 IF PO=1 THEN GOSUB 1135 ELS
E 1220
1210 GOTO1220
1215 GOSUB220
1220 WIDTH80:LT=5:GOSUB210:RESTO
RE:LOCATE5,3:PRINT"Chemical";:LO
CATE22,3:PRINT"Symbol";:LOCATE39
,3:PRINT"State";:LOCATE56,3:PRIN
T"Your Mistake";:GOTO620
1225 LOCATE5,LT:PRINTB$;:LOCATE2
4,LT:PRINTC$;:LOCATE38,LT:PRINTD
$;:ON Z GOTO 820,920
1230 LT=LT+1:IF LT>21 THEN 1215
1235 IF PO=1 THEN GOSUB1140
1240 IF EP>ER THEN 1245 ELSE RET
URN
1245 GOSUB220:ON X GOTO 900,100
1300 REM *** CORRECT ROUTINE ***
1305 LOCATE14,10:ATTR6,4:PRINT"
CORRECT! ";:FORG=1TO700:NEXTG:RA
=RA+1:GOTO1515
1400 REM *** SPELLING & ERROR RO
UTINE ***
1405 IF SP=2 THEN 1435
1410 IF LEN(W$)<>LEN(B$) THEN WE
=WE+1
1415 FORK=1TO(LEN(B$)):IF MID$(W
$,K,1)<>MID$(B$,K,1) THEN WE=WE+
1
1420 NEXTK:IF WE>2 THEN 1435 ELS
E 1425
1425 LOCATE11,10:ATTR6,4:PRINT"
SPELLING ERROR! ";:FORG=1TO700:N
EXTG:AT=AT+1:IF TR=NT THEN 1430
ELSE 1505
1430 SW=SW+1:QS(SW)=A:SE$(SW)=W$
:GOTO1515
1435 LOCATE14,10:ATTR6,4:PRINT"
 ERROR!  ";:FORG=1TO700:NEXTG:AT
=AT+1:IF TR=NT THEN 1440 ELSE 15
05
1440 ER=ER+1:TE$(ER)=W$:QT(ER)=A
:GOTO1515
1500 REM *** RESET ROUTINE ***
1505 TR=TR+1:WE=0:IF I<4 THEN 15
10 ELSE 1520
1510 ON I GOTO 1700,1800,1900
1515 TR=1:WE=0:RETURN
1520 ON U GOTO 1700,1800,1900
1600 REM *** MAIN MENU ***
1605 GOSUB205:LOCATE0,3:PRINT"Se
lect (1 to 5):":GOSUB1610:GOSUB1
615:GOSUB1620:GOSUB1625:GOSUB163
0:GOSUB410:ATTR6,4:ON I GOSUB161
0,1615,1620,1625,1630:ATTR0,0:GO
SUB315:ON I GOTO 505,510,510,505
,515
1610 LOCATE5,8:PRINT"1] Quiz on
Chemical Names";:RETURN
1615 LOCATE5,10:PRINT"2] Quiz on
 Chemical Symbols";:RETURN
1620 LOCATE5,12:PRINT"3] Quiz on
 Physical Properties";:RETURN
1625 LOCATE5,14:PRINT"4] Quiz on
 All Three";:RETURN
1630 LOCATE5,16:PRINT"5] Balance
 Equations";:LOCATE0,22:RETURN
1700 REM *** QUESTION #1 ***
1705 GOSUB205:LOCATE3,5:PRINT"Wh
at is the chemical name for this
   symbol [ ";C$;" ] which is a
";D$;".":GOSUB430:IF W$="" OR W$
=" " THEN 1705:ELSE IF W$=B$ THE
N 1300 ELSE 1400
1800 REM *** QUESTION #2 ***
1805 GOSUB205:LOCATE3,5:PRINT"Wh
at is the chemical symbol for th
is  chemical: ";B$;" which is a
";D$;".";:GOSUB430:IF W$="" OR W
$=" " THEN 1805:ELSE IF W$=C$ TH
EN 1300 ELSE 1435
1900 REM *** QUESTION #3 ***
1905 GOSUB205:LOCATE3,5:PRINT"Wh
at is the physical state of this
   chemical element: ";C$;:GOSUB
430:IF W$=D$ THEN 1300 ELSE 1435
2000 REM *** QUESTION #4 ***
2005 U=RND(3):ON U GOTO 1700,180
0,1900
3000 REM *** OPTION #5 BALANCE E
QUATIONS ***
3005 GOSUB335:GOSUB340:FG=1:FA=Q
L:GOTO3100
3010 GOSUB230:GOSUB215:FG=2:RETU
RN
3100 REM *** INITIALIZE SYMBOL &
 VALUE SEARCH ***
3105 NN=NQ+1:DIM PC$(EN),QC(EN),
HT(EN),QN$(NN),WA$(NN),WB$(NN),R
B$(NN),RC$(NN):FORF=1TONN:FORT=1
TOEN
3110 RN=RND(106):SL=RN+1:FORV=1T
OSL:READA,B$,C$,D$,E:NEXTV:IF RN
=A THEN3115 ELSE 3110
3115 RESTORE:IF E=0 THEN 3110
3120 PC$(T)=C$:QC(T)=E:HI$=HI$+P
C$(T)+"="+MID$((STR$(QC(T))),2,1
)+" ":NEXTT
3200 REM *** BALANCING FORMAT **
*
3205 FORR=4TO1 STEP-1:FORT=1TOEN
:IF QC(T)=R THEN 3215
3210 NEXTT:NEXTR
3215 FL=0:FORT=1TOEN:ON R GOTO 3
705,3605,3505,3405
3220 IF FL=0 THEN 3805
3300 REM *** RE - BALANCE ELEMEN
TS ***
3305 FORT=1TOEN:ON R GOTO 5,3705
,3515,3415
3400 REM *** BALANCE TO 4 th ELE
MENT ***
3405 IF QC(T)=4 THEN QC(T)=0:ELS
E IF QC(T)=3 THEN FL=1:ELSE IF Q
C(T)=1 THEN QC(T)=4
3410 NEXTT:GOTO3220
3415 IF QC(T)=3 THEN QC(T)=4:ELS
E IF QC(T)=0 THEN QC(T)=3
3420 NEXTT:FL=0:GOTO3220
3500 REM *** BALANCE TO 3 rd ELE
MENT ***
3505 IF QC(T)=3 THEN QC(T)=0:ELS
E IF QC(T)=2 THEN FL=1:ELSE IF Q
C(T)=1 THEN QC(T)=3
3510 NEXTT:GOTO3220
3515 IF QC(T)=2 THEN QC(T)=3:ELS
E IF QC(T)=0 THEN QC(T)=2
3520 NEXTT:FL=0:GOTO3220
3600 REM *** BALANCE TO 2 nd ELE
MENT ***
3605 IF QC(T)=2 THEN QC(T)=0:ELS
E IF QC(T)=1 THEN QC(T)=2
3610 NEXTT:FL=0:GOTO3220
3700 REM *** BALANCE TO 1 st ELE
MENT ***
3705 IF QC(T)=1 THEN QC(T)=0
```

```
3710 NEXTT:GOTO3220
3800 REM *** QUESTION VARIABLE S
ET UP ***
3805 FORT=1TOEN:QU$=QU$+PC$(T)+"
+":IF QC(T)=0 THEN 3810 ELSE 381
5
3810 AN$=AN$+PC$(T):AP$=AP$+PC$(
T):AQ$=AQ$+STRING$((LEN(PC$(T)))
,32):GOTO3820
3815 AN$=AN$+PC$(T)+MID$((STR$(Q
C(T))),2,1):AP$=AP$+PC$(T)+" ":A
Q$=AQ$+STRING$((LEN(PC$(T))),32)
+MID$((STR$(QC(T))),2,1)
3820 NEXTT:L=LEN(QU$)-1:QU$=MID$
(QU$,1,L)+"=?"
3900 REM *** QUESTION OUT - PUT
***
3905 IF FG=1 THEN GOSUB 3010
3910 GOSUB335:LOCATE12,9:PRINT"Y
our Question:":CO=INT(40-(LEN(QU
$)))/2:LOCATECO,11:PRINTQU$:GOSU
B345:GOSUB435:IF W$="" OR W$=" "
 THEN 3910 :ELSE IF W$=AN$ THEN
4005 ELSE 4105
4000 REM *** CORRECT ROUTINE ***
4005 LOCATE14,18:ATTR6,4:PRINT"
CORRECT! ";:ATTR0,0:FORG=1TO100:
NEXTG:RA=RA+1:GOTO4305
4100 REM *** ERROR ROUTINE ***
4105 LOCATE14,18:ATTR6,4:PRINT"
 ERROR!  ";:ATTR0,0:AT=AT+1:TR=T
R+1:IF TR=NT THEN 4205
4110 FORZ=1TO500:NEXTZ:IF FA=2 T
HEN FA=4
4115 GOTO3910
4200 REM *** CHEMICAL SUB SCRIPT
 INPUT ROUTINE ***
4205 ER=ER+1:TL=LEN(QU$)-2:QN$(E
R)=MID$(QU$,1,TL):WA$(ER)=W$:WB$
(ER)=W$:RB$(ER)=AP$:RC$(ER)=AQ$
4210 LW=LEN(W$):FORZ=1TOLW:SC=AS
C(MID$(W$,Z,1)):IF SC>59 THEN MI
D$(WB$(ER),Z,1)=" "ELSE GOSUB422
0
4215 NEXTZ:GOTO4305
4220 MID$(WA$(ER),Z,1)=" ":RETUR
N
4300 REM *** RE - SET ROUTINE **
*
4305 IF FA=4 THEN FA=2
4310 HI$="":AN$="":AP$="":AQ$=""
:QU$="":TR=0:NEXTF:GOSUB1000:GOS
UB215
4315 IF GP=1 THEN GOSUB700:GOSUB
215
4320 IF LO=1 AND PO=2 AND ER>0 T
HEN 4410
4325 IF LO=1 AND PO=1 AND ER>0 T
HEN 4335 ELSE 100
4330 IF LO=2 THEN 100
4335 GOSUB1100:GOSUB1150:GOTO441
0
4400 REM *** ERROR PRINT - OUT *
**
4405 WIDTH80:LT=5:GOSUB210:LOCAT
E3,3:PRINT"Chemical Equation:";:
LOCATE31,3:PRINT"Correct Answer:
":LOCATE64,3:PRINT"Your Answer":
RETURN
4410 GOSUB4405:FORT=1TOER:C3=INT
(24-LEN(QN$(T)))/2:C4=INT(24-LEN
(RB$(T)))/2+27:C5=INT(24-LEN(WB$
(T)))/2+56:LOCATEC3,LT:PRINTQN$(
T);:LOCATEC4,LT:PRINTRB$(T);:LOC
ATEC5,LT:PRINTWA$(T);:LT=LT+1:LO
CATEC4,LT:PRINTRC$(T);:LOCATEC5,
LT:PRINTWB$(T);
4415 IF PO=1 THEN GOSUB1155
4420 LT=LT+1:IF LT>20 THEN 4430
4425 NEXTT:GOSUB215:RUN100
4430 GOSUB215:GOTO4405
9300 REM *** DATA ***
9305 DATA 0,0,0,0,0
9310 DATA 1,Hydrogen,H,Gas,1
9315 DATA 2,Helium,He,Gas,0
9320 DATA 3,Lithium,Li,Solid,1
9325 DATA 4,Beryllium,Be,Solid,2
9330 DATA 5,Boron,B,Solid,3
9335 DATA 6,Carbon,C,Solid,4
9340 DATA 7,Nitrogen,N,Gas,3
9345 DATA 8,Oxygen,O,Gas,2
9350 DATA 9,Flourine,F,Gas,1
9355 DATA 10,Neon,Ne,Gas,0
9360 DATA 11,Sodium,Na,Solid,1
9365 DATA 12,Magnesium,Mg,Solid,
2
9370 DATA 13,Aluminum,Al,Solid,2
9375 DATA 14,Silicon,Si,Solid,4
9380 DATA 15,Phosphorus,P,Solid,
3
9385 DATA 16,Sulfur,S,Solid,2
9390 DATA 17,Chlorine,Cl,Gas,1
9395 DATA 18,Argon,Ar,Gas,0
9400 DATA 19,Potassium,K,Solid,1
9405 DATA 20,Calcium,Ca,Solid,2
9410 DATA 21,Scandium,Sc,Solid,2
9415 DATA 22,Titanium,Ti,Solid,2
9420 DATA 23,Vanadium,V,Solid,2
9425 DATA 24,Chromium,Cr,Solid,2
9430 DATA 25,Manganese,Mn,Solid,
2
9435 DATA 26,Iron,Fe,Solid,2
9440 DATA 27,Cobalt,Co,Solid,2
9445 DATA 28,Nickel,Ni,Solid,2
9450 DATA 29,Copper,Cu,Solid,2
9455 DATA 30,Zinc,Zn,Solid,2
9460 DATA 31,Gallium,Ga,Liquid,2
9465 DATA 32,Germanium,Ge,Soild,
2
9470 DATA 33,Arsenic,As,Solid,3
9475 DATA 34,Selenium,Se,Solid,2
9480 DATA 35,Bromine,Br,Liquid,1
9485 DATA 36,Krypton,Kr,Gas,0
9490 DATA 37,Rubidium,Rb,Solid,1
9495 DATA 38,Strontium,Sr,Solid,
2
9500 DATA 39,Yttrium,Y,Solid,2
9505 DATA 40,Zirconium,Zr,Solid,
2
9510 DATA 41,Niobium,Nb,Solid,2
9515 DATA 42,Molybdenum,Mo,Solid
,2
9520 DATA 43,Technetium,Tc,Synth
etic,2
9525 DATA 44,Ruthenium,Ru,Solid,
2
9530 DATA 45,Rhodium,Rh,Solid,2
9535 DATA 46,Palladium,Pd,Solid,
2
9540 DATA 47,Silver,Ag,Solid,2
9545 DATA 48,Cadmiun,Cd,Solid,2
9550 DATA 49,Indium,In,Solid,2
9555 DATA 50,Tin,Sn,Solid,2
9560 DATA 51,Antimony,Sb,Solid,2
9565 DATA 52,Tellurium,Te,Solid,
2
9570 DATA 53,Iodine,I,Solid,1
9575 DATA 54,Xenon,Xe,Gas,0
9580 DATA 55,Cesium,Cs,Liquid,1
9585 DATA 56,Barium,Ba,Solid,2
9590 DATA 57,Lanthanum,La,Solid,
2
9595 DATA 58,Cerium,Ce,Solid,2
9600 DATA 59,Praseodymium,Pr,Sol
id,2
9605 DATA 60,Neodymium,Nd,Solid,
2
9610 DATA 61,Promethium,Pm,Synth
etic,2
9615 DATA 62,Samarium,Sm,Solid,2
9620 DATA 63,Europium,Eu,Solid,2
9625 DATA 64,Gadolinium,Gd,Solid
,2
9630 DATA 65,Terbium,Tb,Solid,2
9635 DATA 66,Dyprosium,Dy,Solid,
2
9640 DATA 67,Homium,Ho,Solid,2
9645 DATA 68,Erbium,Er,Solid,2
9650 DATA 69,Thulium,Tm,Solid,2
9655 DATA 70,Ytterbium,Yb,Solid,
2
9660 DATA 71,Lutetium,Lu,Solid,2
9665 DATA 72,Hafnium,Hf,Solid,2
9670 DATA 73,Tantalum,Ta,Solid,2
9675 DATA 74,Tungsten,W,Solid,2
9680 DATA 75,Rhenium,Re,Solid,2
9685 DATA 76,Osmium,Os,Solid,2
9690 DATA 77,Iridium,Ir,Solid,2
9695 DATA 78,Platinum,Pt,Solid,2
9700 DATA 79,Gold,Au,Solid,2
9705 DATA 80,Mercury,Hg,Liquid,2
9710 DATA 81,Thallium,Tl,Solid,2
9715 DATA 82,Lead,Pb,Solid,2
9720 DATA 83,Bismuth,Bi,Solid,2
9725 DATA 84,Polonium,Po,Solid,2
9730 DATA 85,Astatine,At,Solid,1
9735 DATA 86,Radon,Rn,Gas,0
9740 DATA 87,Francium,Fr,Liquid,
1
9745 DATA 88,Radium,Ra,Solid,2
9750 DATA 89,Actinium,Ac,Solid,2
9755 DATA 90,Thorium,Th,Solid,2
9760 DATA 91,Protactinium,Pa,Sol
id,2
9765 DATA 92,Uranium,U,Solid,2
9770 DATA 93,Neptunium,Np,Synthe
tic,2
9775 DATA 94,Plutonium,Pu,Synthe
tic,2
9780 DATA 95,Americium,Am,Symthe
tic,2
9785 DATA 96,Curium,Cm,Synthetic
,2
9790 DATA 97,Berkelium,Bk,Synthe
tic,2
9795 DATA 98,Californium,Cf,Synt
hetic,2
9800 DATA 99,Einsteinium,Es,Synt
hetic,2
9805 DATA 100,Fermium,Fm,Synthet
ic,2
9810 DATA 101,Mendelevium,Md,Syn
thetic,2
9815 DATA 102,Nobelium,No,Synthe
tic,2
9820 DATA 103,Lawrencium,Lr,Synt
hetic,2
9825 DATA 104,Unnilquadium,Unq,S
ynthetic,2
9830 DATA 105,Unnilpentium,Unp,S
ynthetic,2
9835 DATA 106,Unnilhexium,Unh,Sy
nthetic,2
9900 REM *** SAVE PROGRAM ***
9905 FORF=1TO9:MOTORON:AUDIO ON:
FORK=1TO2500:NEXTK:CSAVE"CHEMV.1
":NEXTF:MOTOROFF
```

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Graphics Utility | CoCo 3

DS69View

"Nothin' is free in this world. Sooner or later, it's going to cost ya," my old man said more times than I can count. Well, maybe it's not always true. Steve Ricketts (STEVEPDX) of Boring, Oregon wants to *give* you a copy of his *DS69View* program. This is a real viewer program for DS-69A/B, 16-level, digitized .PIX pictures.

You don't believe me? Do you think it's one of those do-nothing programs not worth the disk space? Ha! This program is a radically altered version of *C-SEE*, the software originally provided with the DS-69 digitizer by Micro Works. Since Micro Works no longer markets this product, Steve asked for, and received, permission to release his version as public domain software. So, as part of his agreement with them, Steve cannot make money from it. He must give it to you. You can copy it and give it to your friends. And it's all completely legal.

Just slide the disk into the drive and type RUN"DS69VIEW". The first thing you see is the option for either a CMP (composite/TV) or an RGB monitor. Next, set the default file extension. (Most DS-69 pictures use .PIX.) Press ENTER to see the main menu.

The menu has seven options. Option 1 is the directory listing the files on your disk. Option 2 loads a file. If the file you want to load has the default extension, simply type the name of the file. If the extension is different from the default, type it, too. The picture loads much faster than the original *C-SEE* program.

Options 3 and 4 are display options. Option 3 is Lo-Res and Option 4 is Hi-Res. The Lo-Res screen is approximately 325-by-225. The Hi-Res screen is approximately 640-by-225. Option 5 saves the file under a different name or to a different drive. I have a lot of .PIX pictures and this was quite useful for sorting them.

Option 6 allows changing the default drive from which files are saved and loaded. Option 7 allows you to quit the program. If you accidentally press 7, you are returned to the first option screen at which you can press ENTER to continue or Q to quit.

If your library lacks digitized pictures there is no need to worry, the program includes eight digitized pictures to start your collection. As you spread the viewer program around, you'll find there are quite a few out there. For those of you with a modem and no digitized pictures, check your local BBS and Delphi.

There *is* one catch to this free program. Along with your request, send $3 for shipping & handling and the cost of the disk. But if you have a modem and don't want to spend the money, the program has been posted on Delphi. After that, all you'll need is a CoCo 3 and a disk drive.

So, Dad, you *can* get something for nothing — almost.

(Steve Ricketts, 10625 SE 362nd #B32, Boring, OR 97009; 503-663-7169; $3 S/H)

— Randy Cassel

[Editor's Note: Mr. Ricketts has informed us there is also a version of DS69View *for owners of the DS-69B. This version replaces the Lo-Res display option with the 16-level digitizing function. From the same menu you can load, save, view and create digitized images.]*

Word Processing | OS-9 Level II

VED, VPRINT

OS-9 has excellent flexibility in directing its input/output to different peripherals. For this reason, OS-9 word processors have historically been constructed as two separate programs used in two separate steps. For most of us, this is a difficult concept to understand.

Any word processor program must perform three main tasks. First, it must allow entry of your text or recovery of that text from some other source, such as a disk file. Second, it must output that text to a device. Finally it should provide for such added bells and whistles as search-and-replace, headers, footers, mail-merge, indexing or Table of Contents. Programmers usually combine these functions into one package and add some sort of executive control routine as an integrated word processor. But internally, the functions of screen editing and of output formatting are normally done in two very different sub-programs. Some of the bells and whistles are more easily attached to the screen-edit function, while others are more easily attached to the text formatter. Others may be attached to both.

Like most CoCo users, I run a mixture of Disk BASIC and OS-9. I have little patience with extremists who demand we all use one operating system. Certain tasks are much more pleasant under one system than the other.

This OS-9 word processor is sold as two separate programs: *VED* (an editor) and *VPRINT* (a text formatter). One advantage to having two different programs is that it allows you to pick and choose. If you want a good, complete OS-9 word processor, get both programs and run them together. The *VED/VPRINT* package is the best OS-9 word processor I have seen to date. If you are satisfied with either your editor or formatter, purchase just one of these programs and use it with your current setup.

VED

The 28-page manual is clear, but updates are provided on the disk. All options work as advertised and the built-in Help file is adequate. The text-buffer size is normally 53,000 characters. If you need more space, a utility is included to break larger files into smaller ones for editing. The smaller files can of course be easily merged again with OS-9. Please note that while *VED* will operate with 128K, I used it in my 512K CoCo 3.

VED provides for up to 37 macros, allowing you to easily customize your editing environment. Each macro can be up to 28 characters in length. This may not seem impressive until you consider the nesting feature, which allows one macro to call another. I used this feature to create a macro for my entire letterhead, which I then placed inside other macros that provide the addresses of frequent correspondents. With only four key strokes, I can put both my letterhead and the recipient's address at the start of a letter. I do have to back-space to insert a code for the date, which is stored in a buffer in the companion program *VPRINT*.

A file called VedDefs.txt holds pre-

defined settings for tabs, word-wrap, indentations and other common items. This file is also used to store the macros. A new VedDefs.txt can be easily created as needed.

There are some items that take some getting used to. For example, carriage returns are not normally inserted in the text by the word-wrap feature, and you must remember the difference between a screen line and a text line. Inserting extra carriage returns is one way to eliminate this problem, but results in a loss of some of the program's flexibility. Much the same problem bothered me with earlier versions of *Telewriter 64*, and I found work-arounds that I built into my system defaults. These had become so much a part of the background defaults that I found myself being fumble fingers again when I initially configured *VED*.

During search-and-replace operations, the ENTER key cannot be used to generate a carriage return. You should use the ALT-ENTER combination to do this. Wild-card search is supported in a manner I found quite friendly. And in general, the global commands operate well. The manual even has a tip to search for a pattern that may cut across either a screen-line break or a text-line break.

Those using *VED* for programming will enjoy the ability to jump to a line number. Others can use the alternate form that will jump to a text label. All the usual block commands such as Mark, Move, Copy and Delete are included and work well. Append is another useful block command.

I did not cover all of *VED* because the program is just too extensive. In summary, this program has all the features I wanted, is well-organized, user-friendly and appears fault-free. As for the documentation, however, when I wanted to save my file, I could not find Save in the Index except as a Block command. The real Save is on Page 20, not Page 15.

VPRINT

Although *VPRINT* is a slightly more-expensive program, it is much longer, with a manual of almost 115 pages. It should be noted that *VPRINT* does not work in a 128K machine — you'll need 512K. Though, while it hasn't been tested, *VPRINT* may work with the 256K upgrade from Disto. Default files are provided for most of the common printers used in the CoCo Community. Users can use the major features by implementing the proper default file and using the Ready Reference Document. The manual explains the process and how to redesign or customize your default files.

I do take exception with one statement in the manual. The manual states that word processors packaged as a single program "...may be suitable for beginners, but usually lack the power required for more serious users..." Balderdash! This statement seems applicable only to OS-9.

I did not try every feature *VPRINT* supports. For example, I did not test its ability to create Indexing and Tables of Contents, even though these features are important to me. I had no suitable large file in OS-9 to act as a test case for this support. However, I am a fan of this program and found no bugs in either *VED* or *VPRINT*.

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VPRINT supports multiple fonts, including proportional-spaced fonts, if your printer is so-equipped. It also supports double-column output and mail-merge. It allows conditional tests and Macros for programming printout formats. In short, this is the most comprehensive text formatter I have dealt with that retains user-friendliness.

If you think I am prejudiced in favor of these two programs, you are right.

(Bob van der Poel Software, P.O. Box 57, Wynndel, B.C. VOB 2NO Canada or P.O. Box 355, Porthill, ID 83853-0355, 604-866-5772; $24.95 for *VED*; $29.95 for *VPRINT*)

— H. Larry Elman

Music & Sound | CoCo 3

CoCo MIDI Pro

While reviewing *CoCo MIDI Pro*, I was reminded of when I joined the musician's union in 1972. For me it was an unforgettable time of waking at 4 p.m., going to bed at 6 a.m., traveling from place to place, and walking out of a club with more money than when I walked in.

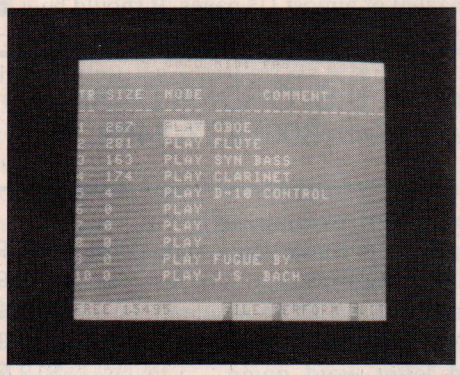
At that time "midi" referred to the length of a girl's skirt. If MIDI instruments were available, poor musicians like me knew little about them. Even now there's plenty about MIDI to which I plead ignorant. I do know that MIDI stands for Musical Instrument Digital Interface. It is an international standard for the transfer of musical information through digital signals. This technology enables the computer to record and play like a tape recorder. One basic distinction is that MIDI recording transcribes musical events such as timing, note values, volume levels, duration and other parameters. The computer does not record actual sounds the way a tape recorder does.

To use *CoCo MIDI Pro* you must have a 512K CoCo 3, a disk drive or cassette recorder and a Multi-Pak Interface or Y-cable. You'll also need a hardware MIDI interface (included with the *CoCo MIDI Pro* package) and a MIDI keyboard or other MIDI-capable instrument.

Simply put, *CoCo MIDI Pro* turns your CoCo into a multi-track recorder for MIDI instruments. If The Beatles recorded the *Sergeant Pepper's Lonely Hearts Club Band* album on a four-track recorder, think what you can do with *CoCo MIDI Pro*'s 16 tracks. In addition, you can record over tracks so that the new music overlays the old without erasing it. This feature gives you the equivalent of 32 tracks. The potential is limitless.

CoCo MIDI Pro has many features — it isn't possible to list all of them in this review, but I'll cover the significant ones. *CoCo MIDI Pro* lets you use the CoCo in master or slave status — *CoCo MIDI Pro* can control or be controlled by other MIDI timing signals, such as those of a drum machine. Each of *CoCo MIDI Pro*'s 16 tracks can be set to one of three modes: play, mute or solo. Play is the normal mode, mute silences particular tracks and solo focuses on certain tracks to the exclusion of the others.

After you've recorded your performance, *CoCo MIDI Pro* provides you with various editing functions. One function lets you perform punch in/out recording. You can also change the pitch, placement and length of any note. All the standard word-processor editing commands are available. With these commands you can insert or delete notes and MIDI events. All the standard block operations such as marking, copying, moving, saving and loading are also available. Other block functions transpose all the notes in a block or set limits on the velocity, pitch, channel assignment and note length. Again, more can be done in the editing mode, but I haven't the room to explain it all in this review.


TR SIZE MODE COMMENT
1 267 PLAY OBOE
2 281 PLAY FLUTE
3 163 PLAY SYN BASS
4 174 PLAY CLARINET
5 4 PLAY D-10 CONTROL
6 0 PLAY
7 0 PLAY
8 0 PLAY
9 0 PLAY FUGUE BY
10 0 PLAY J.S. BACH

CoCo MIDI Pro is menu-driven and easy to use. I had it up and running in minutes. Though the recording and playback procedures are simple, this is not to say editing is easy. You do not edit the music graphically, but rather as a sequence of events in a MIDI file. This is like trying to edit a text file by working on an ASCII dump instead of loading it into a word processor. So it would be difficult, at least for me, to sit down and write a musical score at the computer keyboard. Although I guess it can be done, it would be tedious. More likely, you would record a passage live then adjust and correct your score via the *CoCo MIDI Pro* software.

How does it sound? To answer that question remember that *CoCo MIDI Pro* does not record sounds, it records events. Therefore, you must have a synthesizer or MIDI instrument to play your recordings. To begin with, *CoCo MIDI Pro* divides a beat into 240 "ticks." This translates into "what you play is what you get." Other similar products I've tried sound a bit off time. They have a tendency to move the real-time note to the nearest increment of time the software can record. The effect is similar to taking high-resolution graphics and displaying them on a low-resolution screen. They just don't look the same. The result with these other MIDI products is that they don't sound right. With 240 ticks-per-beat, however, *CoCo MIDI Pro* does not have this problem. My keyboard playing (mistakes included) was accurately reproduced by *CoCo MIDI Pro*. Playback was indistinguishable from the live performance.

CoCo MIDI Pro's documentation consists of a 46-page manual. The manual adequately describes all of the program's many features and contains a table of contents and index for easy referencing. My only criticism is that it goes on and on with few breaks in the text, except headings. A screen dump or picture here and there would help to lighten the reading.

Before you go ahead and order *CoCo MIDI Pro* you should know that all this power and capability has its price; $150 to be exact. Remember, however, the price includes the MIDI hardware interface as well as the *CoCo MIDI Pro* software. I know of no similar product available for the CoCo 3 that equals *CoCo MIDI Pro*. The only enhancement I can imagine would be graphics editing. Graphics editing is a more familiar and natural method to musicians. Most second-generation sequencer software for other personal computers such as Amiga, Macintosh, Atari and IBM have that capability. If you are a musician, or own MIDI equipment, and have a CoCo 3, you'll want to get your hands on *CoCo MIDI Pro*. Hats off to author Lester Hands.

(MusicWare, Hamlet Route Box 1261, Seaside, OR 97138; 503-738-0119; $150)

— Ernest F. Zore

Utility | CoCo 1, 2 & 3

Directory Library

Directory Library is a utility program written for your CoCo 1, 2 or 3 with at least one disk drive. It supports single- or double-sided drives as well as multiple drives.

Directory Library lets you consolidate all of your disk directories into a single file to organize and manage your disk library. This makes it easy to locate the disk containing any particular program or data file you want. You can also make a hard copy of

the directories on your disks that can be cut out and slipped into the disk jacket. The author has wisely chosen to set the program up similar to a book library. The library contains shelves of books and each book contains a table of contents. *Directory Library* is the shelf, any disks are the books and their directories become the table of contents. This theme is used throughout the program and makes it easier to understand the program's logic. In organizing your directory library, you may create as many shelf disks as you want. As "book" disks are added to the "shelf", they are assigned numbers that are like book titles. All you have to do is write a number on the disk, then at any time you can add, update, search, view or print any, or all, directories using the program. Furthermore, you can search your directory library for a single program or data file by its name and the program tells you what disk number it is on. Although OS-9 disk directories can't be read by *Directory Library*, a special name can be assigned to help you locate OS-9 disks in your library.

Directory Library lets you consolidate all of your disk directories into a single file.

Directory Library is written in BASIC and is not copy-protected, so you can make a backup copy for your own protection. A six-page, easy-to-follow instruction booklet is included to get you up and running in a matter of minutes. To start the program, simply type `RUN "L"` and press ENTER. The date must be entered at the beginning of each session. The program defaults to 000000 if no date is entered, but this defeats one of the primary benefits of being able to see the date your program or file was last revised. A main menu is displayed that provides the various selections.

Directory Library is a good, solid utility that does what it's supposed to. It goes about its task with no fuss or bother. I highly recommend the use of a printer to keep things nice and neat. Like any good disk cataloging program, this one also requires consistent use to be effective.

(Johnson Software, P.O. Box 92, Dayton, OH 45449; $17.50 plus $2 S/H)

— Robert Gray

Utility — CoCo 1, 2 & 3

Picture Disk 1

Spruce up that sign, card or invitation. Add some artwork to a school, community or user's group newsletter, even if you can't draw a straight line *with* a ruler. If you have ever traced a transparency from a screen that looks like the artwork of a 2-year-old, call clip art to the rescue.

Clip art is what someone else (usually an artist) creates, and you get the glory by simply pasting their pictures into your sign or document. Zebra Systems helps you complete your graphics needs with *Picture Disk 1*. The clip art on Disk 1 is grouped into four categories: People, School, Science 1 and Science 2. Each category contains 30 pictures for a total of 120 pictures in the package.

According to the manual, the artwork was designed by professional graphics designers. The files are in *CoCo Graphics Designer* (CGD) and *CoCo Graphics Designer Plus* (CGDP) format. The disk contains conversion utilities for generating *CoCo Max*, *CoCo Max II*, *CoCo Max III* and *Max 10* formats. A disclaimer states that deciphering the file formats for Colorware products (the *CoCo Max* line) was accomplished independently without assistance from, or endorsement by, Colorware.

This package includes one disk, a printed manual and 15 pre-printed labels. These labels are used to mark the working disks you must create to use the clip art. To create working disks, place the original disk in Drive 0 and run `MAKEWORK`. During the process you are prompted to alternate between original and working disks. I suggest that Zebra take into account the possibility of systems with multiple drives. Nothing is more aggravating than paying a couple of hundred dollars for a second drive to make procedures like this easier and then having a program totally ignore the machine's resources.

Before running `MAKEWORK`, you must know which file format your graphics package uses. Depending on the destina-

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tion file format, you need a number of blank, formatted disks. For example, to create a working disk with files in the *CoCo Graphics Designer Plus* format, you need one disk. If you want to format for *CoCo Max III*, you'll need four disks. The manual includes a table that clearly indicates the number of disks you need for each case.

There is no longer any reason not to spice up that newsletter, card, invitation or sign.

From the menu in MAKEWORK, select the format for the working disks. When labeling the disks, check each pre-made label carefully before applying it — the labels are very similar. Also, even though the manual says you should label working disks as soon as they are made, I suggest you check the disks first — you wouldn't want to ruin such nice labels just because a disk is defective.

The manual provides specific directions for using the picture disk with each type of file format supported. I was unable to experiment with programs I do not own, but I read the instructions for their use.

I made a backup of the master disk and prepared four disks as working disks for the *Coco Max III* format. Each category was placed on a single disk, in three separate scrapbooks.

After running MAKEWORK, I received the message "Picture Disk. Place picture disk 1 into drive 0 then press any key." I replaced the disk with the blank disk and immediately received an NE error. I checked the indicated line number to find the program was trying to load a picture database. I ran MAKEWORK again, and on getting the Picture disk message I left the original Picture disk in. I then received a message to insert the working disk. It might be best to eliminate that first message or rephrase it. Of course, having the program use both of my disk drives would have eliminated this mistake.

As each clip-art piece is converted, it is generated on screen. This process takes approximately 21 minutes per category. The program indicates when to change disks and when the process is finished. I do not like it that MAKEWORK refuses to return control back to the user.

Once you have generated the clips in the correct file format, read the few paragraphs on how to incorporate the Zebra graphics into your program. Then start pasting.

The means through which you incorporate the clip art is a function of your graphics package, so I can only comment on the quality of the conversion. Since I do not own Zebra Systems' packages, or have access to them, I could only compare the conversion clips to examples in the manual. The cover had some examples of the clip art from each category. On pages 6 and 7 you find the Picture Disk 1 Quick Reference Sheet, a printout of all the graphics images and their names. The conversions were true to the samples in the manual. Despite the earlier disclaimer it seems Zebra has mastered the file conversion process.

I had no problem pasting various graphics into *CoCo Max III* and printing them. Once in *CoCo Max*, you can perform any of its functions on the clip art, including fatbit editing and filling them with colors and patterns. A sample of the pictures on *Picture Disk 1* includes grads, teachers, students, doctors, dancers, babies, business people, speakers and families.

The School category contains personal hygiene pictures, toothpaste, soap, showers, combs. It also contains an eyechart, anti drugs and no smoking signs, fruit, books, pencils, clocks, the world, a map of the United States and a school bus.

Science 1 has addition charts, rulers, beakers, bunsen burners, test tube racks, scales, a benzene ring, an atom symbol, lungs, a cut-away section of the eye, a skull, DNA, a dissected frog, the heart, a magnet, a battery, a drawing of a circuit, Ohm's law, a voltage meter, an oscilloscope and a chemical bottle.

Science 2 contains a phone, clock, phonograph, light bulb, computer, prop plane, movie projector, calculator, Walkman, camera, TV, rocket, planets, thunderstorms, thermometer, pulley, gears, magnifying glass, microscope, convex and concave lenses, robot, comet and tornado.

My criticisms of *Picture Disk 1* are minor. I would like to see the MAKEWORK program use more than one drive if more than one is available. I feel the first message about inserting the Picture disk in Drive 0 after starting MAKEWORK from that disk is misleading and causes difficulties for the novice. Also, the cover of the manual depicts two graphics iamges, a diploma and a representation of forces, that are not included in the Quick Reference sheet or in the graphics files on disk. I also noticed while saving the first scrapbook of Science 2 images, the message onscreen indicated the program was saving the Science 1 scrapbook to disk.

This product is directed toward children, teachers and parents who create newsletters. It would be very useful for school science newsletters, or the science club, since the clip art is heavily concentrated in this area. At $14.95, it is a bargain (less than 13 cents per graphics image). Zebra Systems has produced a useful product. Since the package is called *Picture Disk 1*, it would seem that more clip art is forthcoming. There is no longer any reason not to spice up that newsletter, card, invitation or sign. Whether or not you draw well, you'll want to reach for *Picture Disk 1*.

(Zebra Systems, Inc., 121 S. Burrowes Street, State College, PA 16801; 814-237-2652; $14.95)

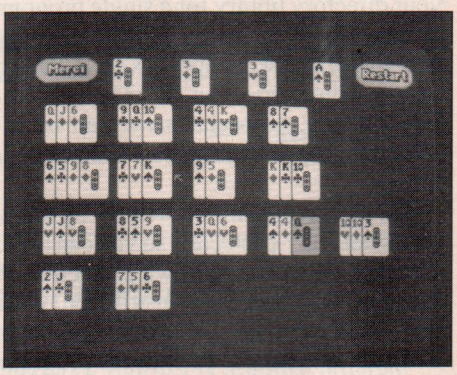
— Kay Cornwell

Game — CoCo 3

La Belle Lucie

If you enjoy playing solitaire card games, this computerized creation is for you. I was impressed from the first time I ran it.

La Belle Lucie is a solitaire game that captures the look and feel of an actual game with playing cards. The game is set up with 52 cards placed face-up in overlapping trios. The cards are played in descending order within the same suit. The object of the game is to play all 52 cards on the four suit foundations in ascending order. This must



be accomplished in three deals. After the third deal, you are allowed to take a Merci, or one free card move, as a last chance to complete the goal. The cards are controlled with the joystick and fire button, which gives the feeling of actually handling the cards.

The game instructions are included on

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In addition to all the programs offered on tape, part of one side of RAINBOW ON DISK is formatted for the OS-9 operating system. That means you can now get all the OS-9 programs from the magazine — programs that cannot be put on tape. Back issues of RAINBOW ON DISK are available beginning with October 1986. Subscriptions to RAINBOW ON DISK are $99 a year in the U.S. Canadian rate is U.S. $115. All other countries, U.S. $130. Single copy rate is $12 in the U.S.; U.S. $14 in Canada; and U.S. $16 in all other countries.*

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the disk and can be called up at any point during play. I especially appreciate this as it eliminates the need to keep up with the instruction sheets.

La Belle Lucie features full-color graphics that are clear, crisp, easy to read and not abrasive to the eyes. The game is very quiet. There are no distracting sounds or noisy music. In fact, the only sound in the game is a beep, which is heard when you attempt an illegal move. The little reward picture shown following a winning hand might put a smile on your face.

The game has a minimum of internal packaging so as to be environmentally compatible. Rather than bubble-pack, which is common to most packaging, a sturdy cardboard package is used. This cardboard package can be recycled. I commend Eversoft's effort.

La Belle Lucie requires a CoCo 3 with 128K, a disk drive and a joystick or mouse. It can be used with either a TV or an RGB monitor.

(Eversoft, P.O. Box 3354, Arlington, WA 98223; 206-653-5263; $14.95, plus $2 S/H)

— Linda Manning

Utility	CoCo 3

COMERR

Many years ago when Color Computers were still silver and 32K was a lot of memory, I purchased an interesting card to go with my CoCo. This card was printed in many colors on a dark-gray background and folded something like a road map. It contained a myriad of wonderful facts about the Color Computer, including some answers to questions I wouldn't have thought to ask. Most important, however, was that it brought all that information together in one place when it was needed. A few years later, THE RAINBOW sent out with subscription renewals a large sheet that reprinted some of their best hints and tips, as well as some very short routines, all of which I keep prominently posted next to my computer desk.

David E. Chipps, of R.S. Research Associates has tried to re-create some of that convenience with his recent package called the *COMERR* series. It consists of three BASIC programs on a single disk. I shall deal with them in order of complexity.

The most simple is `COMMANDS.128`, which lists 90 Color Computer 3 commands on the screen in alphabetical order. Press BREAK to bring up approximately 75 commands. Each command is associated with a number that can be used to select a short, one-line description which appears below the menu. The descriptions are rather succinct and are generally taken directly from the standard Tandy BASIC and Disk Manuals. `COMERR 1.128` is the same as `COMMANDS`, except it includes a third screen with approximately 40 alphabetized errors and their corresponding codes. The commands appear on the second screen once you press BREAK.

La Belle Lucie features full-color graphics that are clear, crisp and easy to read.

I could not run the third program in the package, `COMERR 1.512` since it requires Microcom's 512K BASIC disk boot, a rather rare memory utility I don't own. I haven't even been able to locate it in Microcom's advertisements in THE RAINBOW. I tried running `COMERR 1.512` under DanoSoft's Big BASIC and wound up trashing my directory (a good reason for always making a backup!).

The documentation with *COMERR* is rather skimpy, despite the fact it contains the complete BASIC listings of all three programs. The actual instructions are printed on a single 6½-by-8½ sheet and are somewhat vague. The product, however, needs only a little push and it runs itself.

Perhaps I'm getting a little spoiled working as a programmer on huge mainframe computers at a large insurance company, but my idea of an online Help utility is more along the lines of a pull-down apparatus or a hot-key arrangement, not a stand-alone product. It seems in the time it takes to flip through the disk file to find *COMERR* and load and run it, I could thumb through the manual and find the same reference while the program I am working on is still on the screen. I do not mean to malign the product. It works quite well for its intended purpose, but perhaps the scope could be a bit broader. The price could certainly be lower. A $25 tag is quite steep for a product that would be more at home as a submission to THE RAINBOW than as an offering in the highly competitive mail-order marketplace.

The author recommends using the product as a development tool. I accomplished this by placing most of the `COMERR 1.128` package at the end of a program I was working on and leaving the `ON BRK GOTO` statement as Line 1. If you get stuck with an unusual error or stumped on syntax, press BREAK for a brief summary of what the manuals offer. Unfortunately, the approximate 5K available after *COMERR* is loaded isn't sufficient for any ambitious programming.

COMERR is a marginally useful family of programs offered at a price that should make the buyer think twice before ordering. Its limited capabilities do not justify the $25 tag, unless you're the sort who can never find the manual when you need it. In any case, perhaps you should consider finding or making your own reference card (on cardboard).

(R.S. Research Associates, 479 S. River St., Wilkes-Barre, PA 18702, 717-822-7535; $25)

— Fred Toon

Utility	CoCo 1, 2 & 3

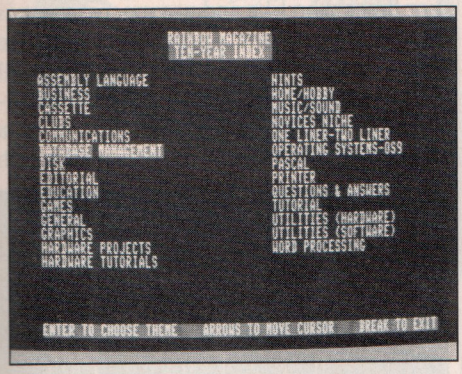
Rainbow Indexes

Have you ever wanted to find information from an article you read in THE RAINBOW, but you can't remember which issue? Or thought of buying a program and wondered if it had been reviewed? To find this information, you break out your stack of THE RAINBOW anniversary issues and examine the indexes. Well, no more. With *Rainbow Indexes*, the needed information is just a few keystrokes away.

Rainbow Indexes comes on two disks and works with any Color Computer with a disk drive. The program includes a single instruction sheet that provides complete operating information. The disks contain six programs and two indexes. The programs are divided into three categories: `CC3ART.BIN` and `CC12ART.BIN` provide indexes to the articles; `CC3RTD.BIN` and `CC12RTD.BIN` provide indexes to the reviews and the RAINBOW ON TAPE/DISK contents; and `PRTARTIC.BAS` and `PRTINDEX.BAS` print the indexes via your printer.

`CC3ART.BIN` and `CC12ART.BIN` index all the articles that have been published in THE

RAINBOW over the last 10 years. These articles are broken into 27 categories ranging from Assembly Language to Word Processing, One Liners, Hints and Questions



and Answers. Both programs start by displaying a menu of the categories. The CoCo 3 version displays all 27 at once, while the version for CoCo 1 and 2 shows them in three sections of nine each. To select a category, simply use the arrow keys to move the cursor onto the desired topic and press ENTER. The CoCo 3 version then displays the article titles on the screen 15 at a time. The entries are sorted by author and, within one author's articles, by title. The month, year and page number are also displayed. To find an article, scroll up and down with the arrow keys or press the first letter of the author's last name to jump straight to the top of that section. The CoCo 1 and 2 version works in much the same way, although it displays only two entries at a time.

The Reviews and Tape/Disk database works the same way. A menu allows you to select which of the 10 years of reviews or tape/disk programs you want to view. The reviews are sorted by product name and the tape/disk programs are sorted by filename. The review entries show the product name as well as the month, year and page number of the review. The program entries show the program name, a description and the month, year and page number. Finding a particular entry works the same way as for the articles.

The Print programs allow printing of the Article index by category and the Reviews and Tape/Disk index by year. Select the appropriate topic from the menu to print a hard copy.

I found these programs very easy to use. They certainly beat searching through old magazines. My only suggestion would be to include specific questions in the Questions and Answers section instead of just the column titles. Overall, I think this is an excellent set of programs and is well worth the price. If you find yourself constantly looking for articles or reviews in back issues of THE RAINBOW, these programs are for you.

(Rick's Computer Enterprise, P.O. Box 276, Liberty, KY 42539; 606-787-5783; $10, $2 S/H)

— Robert Marsa

Utility	OS-9

Goodies Disk One

Utilities — some people hate them while others can't get enough. *Goodies Disk One* from The Warped Drive is a collection of 10 ready-to-run utilities. These utilities are written in BASIC09 and compiled to I-code. The package also includes all appropriate documentation. The utilities on this disk include:

`CCount` — provides a count of how many times a specific character appears in a file.

`DriveSpeed` — determines the time it takes to read one megabyte (by continuously reading the first 1024 bytes on the

Lyra Lyra, the ever popuplar music editor that lets you compose music using a mouse, is also available for the IBM PC. All the music you make with the CoCo version is compatible with the PC version. Only $37 for Lyra and the 100 page Lyra Companion.

CoCo MIDI Pro

CoCo MIDI Pro is a complete 16 track MIDI recording studio. Play music on your MIDI synthesizer and record it into your CoCo. Modify it with CMPro's powerful editing commands, and save it to disk or tape. Many professional musicians use the program and say that it is every bit as good as sequencers running on the IBM PC or Mac. Only $125 for the program and the required MIDI interface program pak.

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media) from a device such as a floppy disk or hard drive. This is useful for finding the optimum interleave for hard drives.

`Random` — determines 10 random numbers within a specified range.

`Chown` — changes the ownership of files.

`FPark` — parks the drive head of a floppy device.

`SetUID` — sets the user ID number of an OS-9 process.

`CoinToss` — simulates a coin toss.

`GetID` — reports the user number of a process.

`Colors` — allows you to determine suitable colors for a color monitor. (Level II only.)

`Median` — calculates the mean and the median for a set of numbers.

These utilities offer something for everyone. The color utility operates only on a CoCo 3 with Level II, but the remainder of the utilities work on OS-9 Level I or II. Also included on the disk is the BASIC09 source code for each utility. The disk incorporates the convenience of a ready-to-run utility as well as a source of good programming techniques. Even if utilities are not your main interest, the educational value of this disk makes it an irresistible temptation. And considering the price, you can't possibly go wrong with this purchase.

(The Warped Drive, 54 Martindale Dr., NE, Calgary, AB T3J 2V4 Canada; $12, $14 CDN)

— Donald D. Dollberg

Utility	CoCo 1, 2 & 3

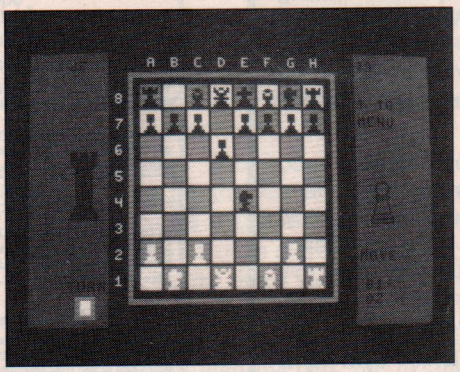
Mixed Blessings

Mixed Blessings is a collection of 23 programs that run the gamut from a font demo to a CoCo security system. There is also a sprinkling of games, music and graphics thrown in for good measure. No matter what your computer interests, chances are you'll find something that captures your attention.

Shorties is a group of one and two liners that, among other things, draws a polygon of any number of sides, converts a number to any base and has a text-screen game in which the object is to avoid running into obstacles. If you are a long-time reader of THE RAINBOW, you may have seen derivations of these same programs over the years. Now you have a handful of such programs in one neat package.

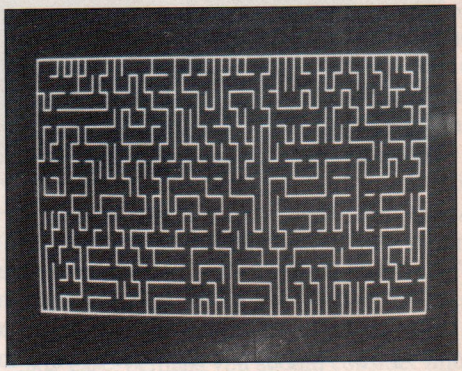
Show me a computer user who says he never plays computer games and I'll show you someone who lies about other things as well. *Saturn's Rings* is a poor-man's version of *Asteroids* in which your space vehicle can blast the boulders in only one direction. It does, however, have the added feature of refueling at stations conveniently placed among the boulders. *Robot vs. the Fatal Computer* is a shoot-everything-until-nothing-is-left game. The premise is to destroy the rogue computer's brain as it drops bombs on you. Talk about being user-unfriendly. *Turmoil* is a text-screen arcade game with a graphics-screen teaser. You are shown a Hi-Res graphics screen with three spinning dials and asked to press the 1-2-3 keys to stop the dials from spinning. Although well done, this sequence struck me as having no direct relationship to the game. However, the dials determine which room your player is sent to — one of nine randomly selected rooms. Each room offers a different challenge in either getting to the other side, avoiding obstacles, collecting objects or answering riddles. *Chessboard* is a two-player chess game that, among other things, checks for illegal moves.

Mixed Blessings is a collection of 23 programs that run the gamut from a font demo to a CoCo security system.



For more serious users *Mempeek* is a program that lets you explore the CoCo's ROM. *Screenmaster* allows for the creation of up to 24 Lo-Res graphics screens which can be stored in the PMODE graphics area. There is also a *Selective Backup* and a *Disk Auto Copy*. The *Selective Backup* copies only those sectors with data and skips over the blank sectors. *Disk Auto Copy* copies the entire disk.

Mailing Inventory allows you to store up to 500 names and addresses on one disk. For those who like and use macros there is *Macro Masterpiece*, a program designed to help you memorize macros through a small printout and a quiz to become more proficient in their use. *Security System* is a program that can detect movement through the right joystick or a light pen. To scare a prowler it can flash a red screen as well as turn on a tape recorder with a pre-recorded message or siren.



For graphics buffs there is a demo called *Fourlord Demo*. This demo draws graphics screens to show the power of M/L routines, such as scrolling up, down, left and right, reversing colors or turning the image upside down. *Fourlord Demo* is a good display of the CoCo's power.

The best program and, perhaps, the reason to get this package of programs is *Mazemaker II*. This program generates an infinite number of random mazes with 11 levels of difficulty. It checks to see if the maze is solvable. The user can then save it, try to get through it or edit it for increased or decreased difficulty. *Mazemaker III* uses the CoCo 3's Hi-Res screen, but cannot check solvability on Level 11. The program is available on both disk and tape and provides a dump, but only for the DMP-105 and compatibles.

Space does not allow me to list everything on the disk. The package comes with eight pages of documentation and instructions, with the highlights of each program. There is even a list of useful peeks and pokes printed on one of the pages.

A few of these programs work only on a CoCo 3, but most work on any CoCo with Extended BASIC and at least 32K. Those using a CoCo 3 may find that some programs disable the automatic HCLS feature. To restore it, enter `POKE 59078,141`.

(John Friedrich, Grove City College, Box 1877, Grove City, PA 16127; 412-458-3088 or 412-224-4194; $12.95)

— George Aftamonow

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Received and Certified

The following products have recently been received by THE RAINBOW, examined by our magazine staff and issued the Rainbow Seal of Certification, your assurance that we have seen the product and have ascertained that it is what it purports to be.

◆ **Baseball Stats**, a database that allows you to keep track of your favorite teams by year, game number and individual players. Files can be continually updated and games may be entered in any order. All files can be edited, saved and reloaded. Special features include the presentation of game, team and seasonal scores, automatic computation of hitting and pitching statistics and the options for making printouts of individual player stats. *Trading Post, P.O. Box 3453, Carbondale, IL 62902-3453; (618) 457-5258; $39.95 plus $3 S/H.*

BASIC Windows Version 2.0, a machine-language program for the 512K CoCo 3 designed to create four working windows under Disk BASIC. *KB Enterprises, 435 Brightwaters Drive, Cocoa Beach, FL 32931; (407) 799-3253; $34.95 plus $3 S/H.*

◆ **Envelope Writer**, For daisy-wheel printers. Prints mailing and return addresses directly on the envelope. Owners of dot-matrix printers can use this program in conjunction with specially prepared tractor feed envelopes. Customize fonts for use with Tandy printers. Requires 16K CoCo 1, 2 or 3 and Tandy or similar printer. *Trading Post, P.O. Box 3453, Carbondale, IL 62902-3453; (618) 457-5258; $19.95 plus $3 S/H.*

CoCo Cassette #99, a monthly variety package of 10 different programs. This month's product includes a Morse code tutor, four games, a non-graphics biblical adventure, an alphabet tile sliding puzzle, a business proposal writer, a business contact database, and a program for organizing your ideas. Instructions for last month's *Maze Master 3* and the missing files for *Wizard's Den* are included. *T&D Software, 2490 Miles Standish Dr., Holland, MI 49424; (616) 399-9468; $8 each, $70 for a one-year subscription.*

KJV on Disk #16, the book of II Chronicles from the King James version of the Bible, in ASCII files for the CoCo 1, 2 and 3. Word processor or text editor is recommended for viewing the files. Requires at least 32K and one disk drive. *BDS Software, P.O. Box 485, Glenview, IL 60025-0485; $3.*

OS-9/68000 Microware BASIC Version 2.3, a version of BASIC for Motorola 68000 systems running OSK. It is source-code compatible with BASIC09 for the 6809 and supports all of the keywords available in the OS-9/6809 version (except calls to `gfx` and `gfx2`, which are not supplied). Microware BASIC supports from 4K to nearly 16 megabytes of memory for its workspace. *Microware Systems Corporation, 1900 N.W. 114th Street, Des Moines, IA 50322; (515) 224-1929; $500 plus $5 S/H.*

Michael Milazzo Mystical Data, cassette tape of original music by Michael Milazzo, performed with *CoCo Midi 3/Pro*. Songs include "Lunar," "Dragonslair," "Equinox," "Renaissance," "Excursion," "Roundtable," "Moondrone," "Midnight Frost" and "Into the Light." *Rulaford Research, P.O. Box 530328, San Diego, CA 92153; (619) 690-1181; $9.95.*

◆ **DSDISK#1**, four shareware programs requiring 32K ECB and a disk drive. *Karate Lesson #1* is a graphics program for testing response time against two opponents. *3D Function Plot* lets you plot 3D graphics. There are demos displaying 3D animation. The last program is a CoCo 2 bouncing-ball demo. All machine-language subroutines on *DSDISK#1* are hand-written in 6809 machine code, without using any assemblers, for maximum speed and efficiency. *David Sham, 1155 E. 33rd Ave, Vancouver, B.C., Canada V5V 3B4; $12 US plus $3 US S/H.*

Notebook, a general-purpose database generator and file/data management program to keep direct access records for practically any information you desire. Keep, maintain, view, and print your *Notebook* data diskette directories as well as your file information. Keeps records of family information (birthdays, phone numbers, anniversaries, etc.), video tapes, cooking recipes, personal diary, etc. *Notebook* runs on a CoCo 1, 2 or 3 with single or multiple disk drives and works with any printer. It also comes with a database of Table of Contents of Product Reviews from the 1990 series of Rainbow magazines. *Johnson Software, P.O. Box 92, Dayton, OH 45449; (513) 866-2601; $23.95 plus $2.50 S/H.*

◆ **First product received from this company**

The *Seal of Certification* is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the program does *exist* — that we have examined it and have a sample copy — but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW reviewers for evaluation.

DARTS

by Mark Webb

No pub, no ale; just don't hit the bull's tail

I had never seen a darts game designed specifically for the CoCo, so I reviewed my high school trigonometry to produce one. *Darts* is designed to run on a CoCo 3 with an RGB monitor.

The game begins with the title screen. Press any key to start the game. The computer draws the game screen and you are given a choice of playing either 501 or Tactics.

With 501, your score starts at 501. Subtract the shots hit on the board from this until your score reaches exactly zero. Your last shot must be a double, that is you have to double out. If you go below zero, just press ENTER to pass. It's up to you to count your score on the dart board and accurately enter it.

In Tactics, the scoreboard is drawn differently, and you are provided with a list of targets to hit. You must get three of each target and the most points to win this round. Once you have three of any specific target, future hits on that target add points to your score, unless the other player also has three of that tar-

Mark Webb is an outdoor enthusiast whose activities include hiking in the mountains, water skiing, trailblazing and fishing. He can be contacted at Box 793, Gold River, BC, Canada V0P 1G0. Please include an SASE when requesting a reply.

GET 'EM WHILE THEY'RE STILL HOT

BACK ISSUES STILL AVAILABLE

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MOST ISSUES STILL AVAILABLE

Issues July 1981 through June 1982 are available on white paper in a reprint form. All others are in regular magazine form. VISA, MasterCard and American Express accepted. Kentucky residents please add 6 percent sales tax; Canadian residents, 7 percent GST.
In order to hold down costs, we do not bill, and no C.O.D. orders are accepted.
Due to heavy demand, we suggest you order the back issues you want now while supplies last.
To check availability and order, review and fill out the form below and mail it with your payment.
For greater convenience, order through the Rainbow Magazine Services area of our Delphi CoCo SIG.

RAINBOW INDEX

A complete index for, July 1981 through June 1984, is printed in the July 1984 issue. Separate copies are available for $2.50 plus 50¢ handling.

Indexes for subsequent years are published annually in the July issues of THE RAINBOW.

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DEC 81	Holiday	$2.00	❑
FEB 82		$2.00	❑
	VOLUME 2		
JUN 83	Printers	$2.95	❑
	VOLUME 3		
AUG 83	Games	$2.95	❑
SEP 83	Education	$2.95	❑
OCT 83	Graphics	$3.95	❑
MAR 84	Business	$3.95	❑
APR 84	Gaming	$3.95	❑
MAY 84	Printer	$3.95	❑
JUN 84	Music	$3.95	❑
JUL 84	Anniversary	$3.95	❑
	VOLUME 4		
AUG 84	Games	$3.95	❑
SEP 84	Education	$3.95	❑
OCT 84	Graphics	$3.95	❑
NOV 84	Data Comm.	$3.95	❑
DEC 84	Holiday	$3.95	❑
JAN 85	Beginners	$3.95	❑
FEB 85	Utilities	$3.95	❑
MAR 85	Business	$3.95	❑
APR 85	Simulations	$3.95	❑
MAY 85	Printer	$3.95	❑
JUN 85	Music	$3.95	❑
JUL 85	Anniversary	$3.95	❑
	VOLUME 5		
AUG 85	Games	$3.95	❑
SEP 85	Education	$3.95	❑
OCT 85	Graphics	$3.95	❑
NOV 85	Data Comm.	$3.95	❑
DEC 85	Holiday	$3.95	❑
JAN 86	Beginners	$3.95	❑
FEB 86	Utilities	$3.95	❑
MAR 86	Business	$3.95	❑
APR 86	Home Help	$3.95	❑
MAY 86	Printer	$3.95	❑
JUN 86	Music	$3.95	❑
JUL 86	Anniversary	$3.95	❑
	VOLUME 6		
AUG 86	Games	$3.95	❑
SEP 86	Education	$3.95	❑
OCT 86	Graphics	$3.95	❑
NOV 86	Data Comm.	$3.95	❑
DEC 86	Holiday	$3.95	❑
JAN 87	Beginners	$3.95	❑
FEB 87	Utilities	$3.95	❑
MAR 87	Business	$3.95	❑
APR 87	Home Help	$3.95	❑
MAY 87	Printer	$3.95	❑
JUN 87	Music	$3.95	❑
JUL 87	Anniversary	$3.95	❑
	VOLUME 7		
AUG 87	Games	$3.95	❑
SEP 87	Education	$3.95	❑
OCT 87	Graphics	$3.95	❑
NOV 87	Data Comm.	$3.95	❑
DEC 87	Holiday	$3.95	❑
JAN 88	Beginners	$3.95	❑
FEB 88	Utilities	$3.95	❑
MAR 88	Business	$3.95	❑
APR 88	Home Help	$3.95	❑
MAY 88	Printer	$3.95	❑
JUN 88	Music	$3.95	❑
JUL 88	Anniversary	$3.95	❑
	VOLUME 8		
AUG 88	Games	$3.95	❑
SEP 88	Education	$3.95	❑
OCT 88	Graphics	$3.95	❑
NOV 88	Data Comm.	$3.95	❑
DEC 88	Holiday	$3.95	❑
JAN 89	Beginners	$3.95	❑
FEB 89	Home Help	$3.95	❑
MAR 89	Hardware	$3.95	❑
APR 89	Business	$3.95	❑
MAY 89	Printer	$3.95	❑
JUN 89	Summer Fun	$3.95	❑
JUL 89	Anniversary	$3.95	❑
	VOLUME 9		
AUG 89	Beyond BASIC	$3.95	❑
SEP 89	Education	$3.95	❑
OCT 89	Graphics	$3.95	❑
NOV 89	Data Comm.	$3.95	❑
DEC 89	Holiday	$3.95	❑
JAN 90	Beginners	$3.95	❑
FEB 90	Home Help	$3.95	❑
MAR 90	Hardware	$3.95	❑
APR 90	Business	$3.95	❑
MAY 90	Printer	$3.95	❑
JUN 90	Summer Fun	$3.95	❑
JUL 89	Anniversary	$3.95	❑
	VOLUME 10		
AUG 90	0S-9	$3.95	❑
SEP 90	Education	$3.95	❑
OCT 90	Graphics	$3.95	❑
NOV 90	Data Comm.	$3.95	❑
DEC 90	Holiday	$3.95	❑
JAN 91	Beginners	$3.95	❑
FEB 91	Home Help	$3.95	❑

get. To enter your score, with the arrow go to the bottom where the number is and press ENTER. Type in the amount of your score and press ENTER. Enter your score carefully, the computer won't verify your entries on the board. After entering your score, press the right arrow to change players.

Dart Throwing 101

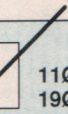
When the Ready message appears at the bottom of the screen, you can throw a dart or quit the game. To throw a dart, look at the graph on the two sides of the dart board. Press F2 to start the cursor on the bottom graph moving. Press F2 again when the arrow reaches the horizontal position you want. Immediately a second bar starts moving up. Again press F2 to stop this bar in the desired location. The dart will hit approximately at the point where these two lines intersect on the dart board. If the bar on either graph goes all the way to the end of it, your throw is cancelled and you must try again.

The games don't end automatically. When the game is over, press Q to quit. You have the option to continue play or quit the game. If you choose to quit, you'll see another prompt asking if you want to play again.

I hope you have fun with *Darts*.

❑

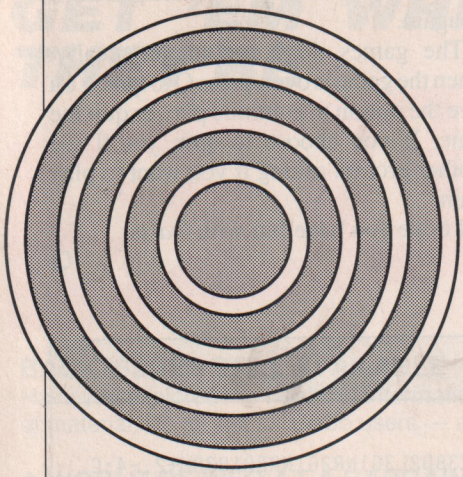
CoCo 3



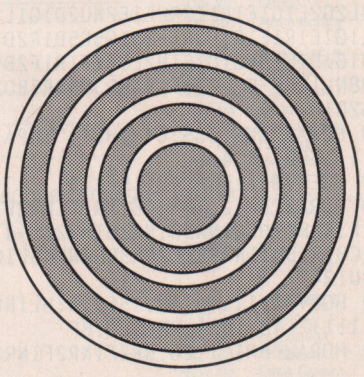
11Ø 129	1Ø9Ø..... 21Ø	228Ø 116
19Ø 17	122Ø 47	237Ø 47
23Ø 2Ø3	133Ø 176	247Ø 125
28Ø 29	142Ø 115	258Ø 158
36Ø 228	154Ø 1Ø3	267Ø 27
46Ø 146	163Ø 224	274Ø 174
54Ø 52	17ØØ..... 191	283Ø 168
62Ø 32	176Ø 129	2883 198
72Ø 167	183Ø 113	2895 117
81Ø 111	194Ø 2Ø3	298Ø 192
9ØØ..... 46	2Ø5Ø..... 255	3Ø8Ø..... 92
99Ø 9Ø	217Ø 189	END..... 126

The Listing: DARTS

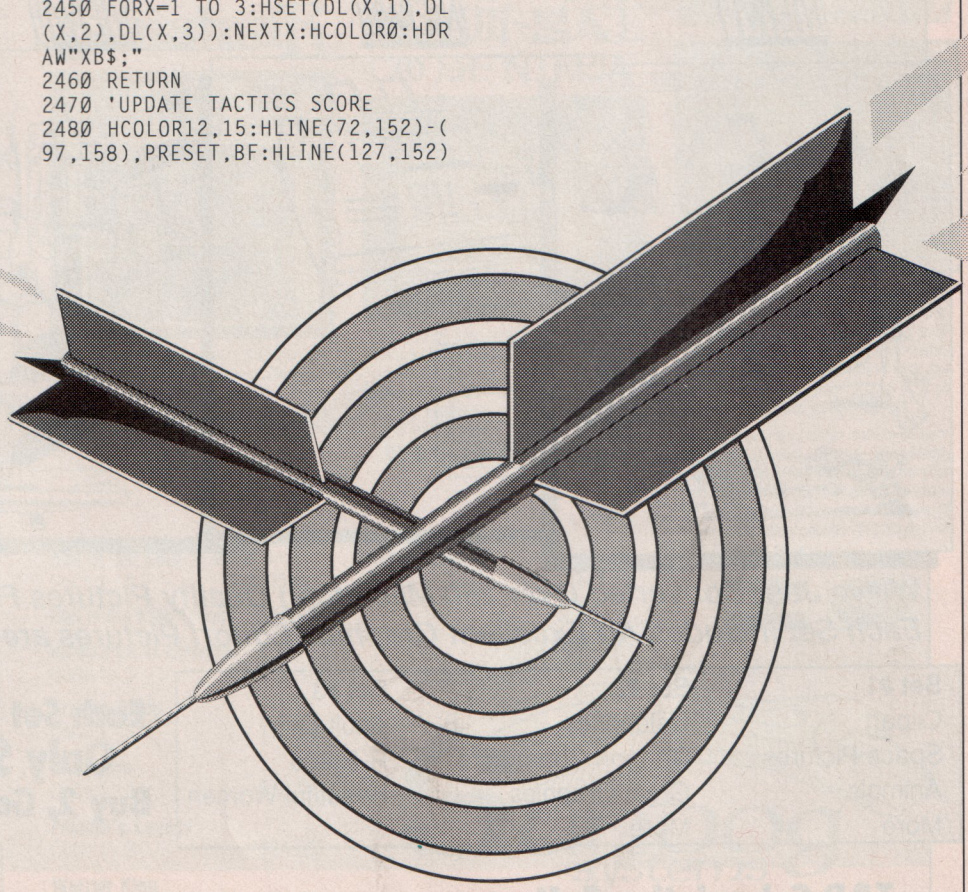
```
10 'DARTS
15 'WRITTEN BY MARK WEBB
20 'COPYRIGHT FEBRUARY 1991
25 'BY FALSOFT, INC.
30 'RAINBOW MAGAZINE
40 '
50 CLEAR1000
70 POKE65497,0
80 DIM QV(20),X,Y,Z,A,B,R,S,F,Q,
A1,HV,C,D,E,RA,Y1,Z1,L,M,G,H,DT,
B1,TK(12),H1$,H2$,H3$,P(2,12),DL
(3,3),PF(2,2)
90 HSCREEN2
100 GOTO3000
110 HCLS0:PALETTE0,4:POKE&HFF9A,
0
120 PLAY"T255L255V31":HCOLOR4,0
130 DATA 58,36,16,35,53,9,31,63,
7,51,0,44,58,36,16
140 FORX=1 TO 15:READA:PALETTEX,
A:NEXT
150 DATA 3,17,2,15,10,6,13,4,18,
1,20,5,12,9,14,11,8,16,7,19
160 FORX=1 TO 20:READQV(X):NEXTX
170 FORX=1 TO 4:HBUFFX,1020:NEXT
X
180 HBUFF 5,155:HBUFF6,155:HBUFF
7,10:HBUFF8,10:HBUFF9,10:HBUFF10
,10:HBUFF11,3435
190 H1$="BM+14,0;U8H1U2NE2BR3NE2
BL3H1U1H6U1H1U1H1U3E1BR1R1BL2U1E
1U1E2U1R1U1E4R1E1R2D2G1ND3G3D1G1
L1G1D1G1E1U1E1R1E1U1R3F1G3D1G1BL
1L1BR2E1U1E3R1E1R1F1D1G1D1G2D1BL
1L1BR2U1E4R1F1D3G1D1G1L1R1D3F1D5
G1D1F1D2F1D2F1D1F1D2F1D2NL13BL8"
195 H1$=H1$+"BU18U4BL4D2F1D1F1BL
4H1U1H1U1H2"
200 HDRAW"BM0,155;C4;XH1$;":HPAI
NT(18,145),5,4
210 HDRAW"BM0,124;C6;R2E1NL2E1NL
2E1NL2E1R1L3BU2NR3H1NR2H1NR2H1NR
2H1NR2BM+5,+5;C8;R5BR7NR9;C7;E1R
3BD2L4BL8L1BU2R3"
220 HGET(0,111)-(42,156),1:HLINE
(0,156)-(42,111),PRESET,BF
230 H2$="BR12U6E1U11H1U1H1U2H1U3
H1U2E6R1E2R1E1R2E1R2F1D1G1L1G2L2
G2L1G3BL1L1BR2E1NF1E2R1E2R2F2G2L
1G2E2R1E2R1U3D3R2D1G1D1G3NF1E3R1
U1R2F1D1G1D1G1D1G2D3G1D3G1D15NL1
2;BM-10,-26;F1D2F1D2BR3U5BR5BD1D
1G1D1G1D1"
240 HDRAW"BM0,155;C4;XH2$;":HPAI
NT(17,150),5,4
250 HDRAW"BM8,113;C6;NR2F1NR2F1N
R2F1R3BD2L3G1NR2G1NR2G1NR2BM+4,-
4;C8;R5;BR10NR8U1C7NR3BD2NR3L1BL
10L1BU2R4"
260 HGET(0,111)-(42,156),2:HLINE
(0,156)-(42,111),PRESET,BF
270 H3$="BR14U6E1U2E1U3E1U5H1U3H
1U3H1U4E2R1E3R1E1R1E1R2E1R5D1G2L
2G2L2G2L1G1E1R1E2R2E1F2NU2D1G1L1
G1L1G1E1R1E1R1E2R1F1D1G5E5D1R2D3
G3D1G1D1G1D4G1D1G1H2L1H1F1R1F2D5
G1D8NL12BM-8,-27;F1D4BR3U5BR5BD2
D1G2D1"
280 HDRAW"BM0,155;C4;XH3$;":HPAI
NT(17,150),5,4
290 HGET(0,111)-(42,156),4
300 HDRAW"BM12,113;C6;NR2F1NR2F1
NR2F1R3BD2L3G1NR2G1NR2G1NR2BM+4,
-4;C8;R5BR11NR8E1C7NR3BG2NR5BL12
U1BU1R4"
310 HGET(0,111)-(42,156),3:HLINE
(0,111)-(42,156),PRESET,BF
320 HDRAW"BM1,1;C6;NR2F1NR2F1NR2
F1R3BD2L3G1NR2G1NR2G1R2BM+2,-4;C
8;R27L6BUC7;NL18BD2L18"
330 HGET(1,1)-(32,9),5:HLINE(0,0
)-(32,9),PRESET,BF
340 HGET(1,1)-(32,9),6
350 HCOLOR9:HLINE(0,24)-(24,0),P
SET:HLINE(0,48)-(48,0),PSET
360 HLINE(271,0)-(319,48),PSET:H
LINE(295,0)-(319,24),PSET
370 HPAINT(8,24),6,9:HPAINT(280,
4),6,9
380 FORX=1 TO 300
390 Z=RND(48):Y=RND(48)
400 IF HPOINT(Z,Y)=6 THEN HSET(Z
,Y,9)
410 IF HPOINT(319-Z,Y)=6 THEN HS
ET(319-Z,Y,9)
420 NEXT
430 HSET(32,8,3):HPAINT(32,8),11
,9
440 HSET(280,6,3):HPAINT(280,6),
11,9
450 HCOLOR9:HLINE(0,0)-(319,191)
,PSET,B
460 HLINE(0,167)-(104,171),PSET,
BF
470 FORX=20 TO 100 STEP20:HLINE(
X,171)-(X,191),PSET:HPAINT(X-2,1
73),11,9:NEXT
480 FORX=1 TO 100
490 A=RND(99):B=170+RND(20):IFHP
OINT(A,B)=11 THEN HSET(A,B,4) EL
SE490
500 NEXT
510 HCOLOR12:HLINE(168,176)-(280
,176),PSET:HLINE-(280,56),PSET
520 FORX=168 TO 280 STEP6:HLINE(
X,176)-(X,173),PSET:NEXT
530 FORX=176 TO 56 STEP-6:HLINE(
277,X)-(280,X),PSET:NEXT
540 HCOLOR3:HLINE(90,6)-(111,15)
,PSET,BF:HGET(101,8)-(102,12),7:
HGET(100,12)-(104,13),9:HCOLOR0:
HLINE(90,6)-(111,15),PSET,BF
550 HDRAW"BM216,63;C12;NR3U4R3U3
L3BR5R2D7L2U7"
560 HDRAW"BM249,160;NR3U3R3U4L3"
570 HDRAW"BM219,170;R3U4NL2U3L3"
:HDRAW"BM232,168;R3L1U7D1NL1U1BR
4R2D7"
580 HDRAW"BM259,148;R3L1U6D1NL1U
1BR3NR3D3R3D3L3"
590 HDRAW"BM267,132;R3L1U6D1NL1U
1BR3R3D6L3U6"
600 HDRAW"BM270,115;R4U3L4ND2U2R
3"
610 HDRAW"BM265,99;R3L1U6D1NL1U1
BR3R3D3NL2D3L3"
```



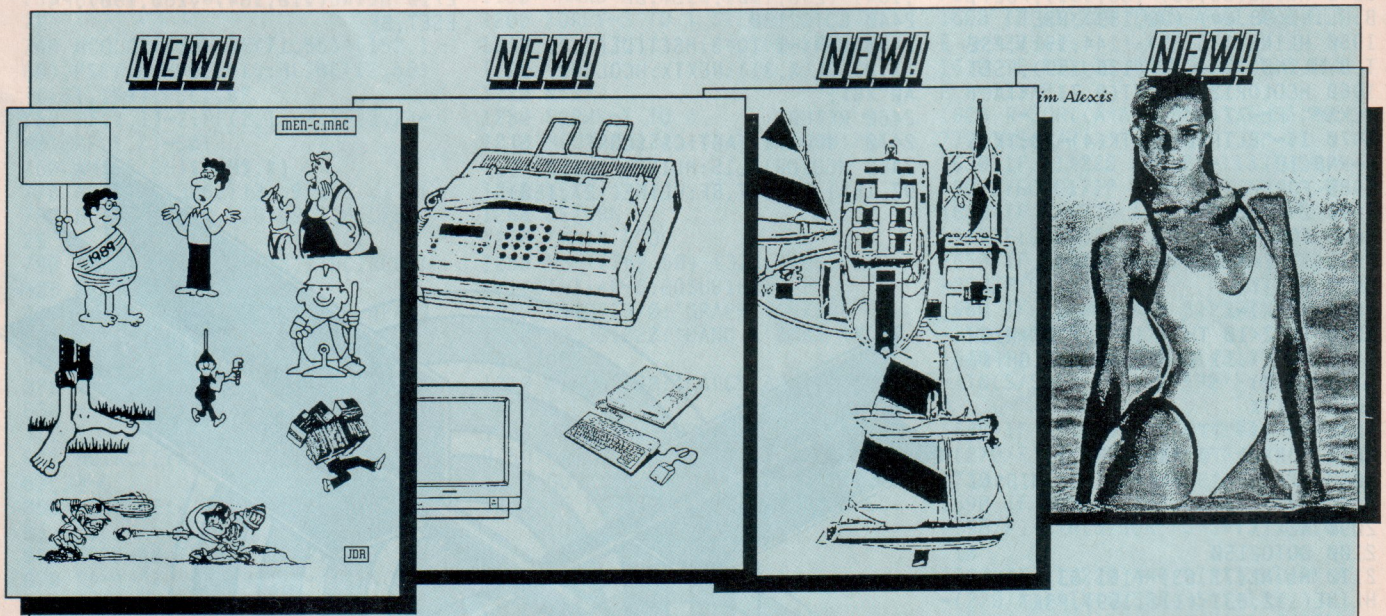
```
620 HDRAW"BM260,86;BR4U6D3NR1L4U
3"
630 HDRAW"BM247,71;R3L1U7D1NL1U1
BR3R3D4NL2D3L3U7"
640 HDRAW"BM201,66;R3U4L3U3R3"
650 HDRAW"BM182,75;R3L1U7D1NL1U1
BR3R3D4L3D3R3"
660 HDRAW"BM175,85;BR3U7L3D4R3"
670 HDRAW"BM165,100;R3L1U7D1NL1U
1BR3D4R3L1NU4D3"
680 HDRAW"BM162,116;R3L1U7D1NL1U
1BR4D1NL1D6L1R2"
690 HDRAW"BM235,66;R3L1U7D1NL1"
700 HDRAW"BM171,146;R3L1U7D1NL1U
1BR3D7R3U3L2"
710 HDRAW"BM188,160;U7L3"
720 HDRAW"BM203,167;U6D1NL1D5L1R
2BR4U6L3D2R2"
730 HDRAW"BM168,132;R3U3NL3U4L3D
7"
740 HCOLOR14:HLINE(71,55)-(152,1
60),PSET,B:HCOLOR15:HLINE(72,56)
-(151,159),PSET,BF
750 PF(1,1)=2:PF(2,1)=2:PF(2,2)=
501:PF(1,2)=501
760 AM$=RIGHT$(AM$,X)
770 HCIRCLE(306,113),9,1,6
780 HCIRCLE(310,113),9,1,6,.75,.
25
790 HPAINT(307,112),3,1:HCIRCLE(
306,113),2,2,3
800 HCIRCLE(306,113),6,1,6:HPAIN
T(317,113),1,1
810 'MAIN CIRCLE
820 A=220:B=113:C=13:D=14:E=15
830 HCIRCLE(A,B),48,C:HPAINT(A,B
),E,C
840 HCIRCLE(A,B),44,C:HCIRCLE(A,
B),30,C
850 HCIRCLE(A,B),26,C:HCIRCLE(A,
B),6,C
860 FORX=10 TO 370 STEP18
870 RA=X/57.29577951:Y=A+SIN(RA)
*47:Z=B+COS(RA)*47
880 HCOLORC:HLINE(A,B)-(Y,Z),PSE
T
890 NEXTX
900 HCOLORD:HCIRCLE(A,B),7,D:HCI
RCLE(A,B),6,D:HCIRCLE(A,B),5,D:H
LINE(A-1,B-1)-(A+1,B+1),PSET,BF:
HCIRCLE(A,B),8,C
910 HCIRCLE(A,B),8,C
920 'MAIN CIRCLE PAINTS
930 FORX=33 TO 393 STEP36
940 RA=X/57.29577951:Y=A+SIN(RA)
*45:Z=B+COS(RA)*45
950 RA=(X+18)/57.29577951:Y1=A+S
IN(RA)*31:Z1=B+COS(RA)*31
960 HPAINT(Y,Z),D,C:HPAINT(Y1,Z1
),D,C
970 RA=X/57.29577951:Y=A+SIN(RA)
*27:Z=B+COS(RA)*27:HPAINT(Y,Z),D
,C
980 RA=(X+18)/57.29577951:Y=A+SI
N(RA)*23:Z=B+COS(RA)*23:HPAINT(Y
,Z),D,C
990 NEXT
1000 GOTO1270
1010 'DART ARC EQUATIONS
1020 FORX=12 TO 15:PALETTEX,4:NE
XT
1030 K=((176-B)/120)/30:L=0:M=0:
GOSUB1190
1040 FORX=210 TO 150 STEP-4
1050 L=L+K:M=M+2.7:RA=X/57.29577
951
1060 A=230*SIN(RA)+170:B=(230*CO
S(RA)*L)+122+M
1070 IF X=150 THENA=A-(((276-A1)
/4.9)*2)/2-1
1080 A=INT(A/2)*2+1
1090 IF X=210 THEN G=A:H=B:HGET(
A,B)-(A+31,B+8),6
1100 HPUT(G,H)-(G+31,H+8),6,PSET
1110 HGET(A,B)-(A+31,B+8),6
1120 IF X<157 THEN HPUT(A,B)-(A+
31,B+8),5,OR:GOTO1140
1130 HPUT(A,B)-(A+31,B+8),5,PSET
1140 G=A:H=B
1150 NEXTX
1160 PLAY"O1C"
1170 PALETTE12,44:PALETTE13,58:P
ALETTE14,36:PALETTE15,16
1180 RETURN
1190 'HAND ANIMATE SUB
1200 FORHV=3 TO 1 STEP-1
1210 HPUT(2,121)-(44,166),HV,PSE
T
1220 NEXT
1230 FORHV=1 TO 4
1240 HPUT(2,121)-(44,166),HV,PSE
T
1250 NEXT
1260 RETURN
1270 'MAIN LOOP
1280 HGET(262,50)-(313,176),11:P
T=1:DT=1:AP=6:GOSUB1860
1290 GOSUB1370:'GRAPH ROUTINE
1300 GOSUB1020:'HAND & DART ARC
EQUATONS
1310 GOSUB1580:'CALCULATE RADIUS
 & ANGLE
1320 DT=DT+1:IFDT=4 THEN HPUT(26
2,50)-(313,176),11,PSET:GOTO1340
1330 GOTO1290
1340 IF FL=77 THEN GOSUB 2160 EL
SE GOSUB2600
1350 IF PT=1 THEN PT=2 ELSE PT=1
1360 DT=1:GOTO1290
1370 'GRAPH SUB
1380 HCOLOR6,0:HPRINT(14,23),"RE
ADY. . .USE F2 KEY"
1385 I$=INKEY$
1390 IFPEEK(344)=191THEN1400
1392 IFI$="Q" THENGOSUB2830
1395 GOTO1385
1400 HCOLOR0:HPRINT(14,23),"READ
Y. . .USE F2 KEY":SOUND233,2
1410 FOR X=170 TO 275 STEP 2
1420 HGET(X,171)-(X+1,175),8:HPU
T(X,171)-(X+1,175),7,PSET
1430 IF PEEK(344)=191 THEN 1470
1440 HPUT(X,171)-(X+1,175),8,PSE
T
1450 NEXTX
1460 PLAY"O1CCCGCCC":GOTO1380
1470 A=X:A1=X:SOUND122,3
1480 FORY=176 TO 56 STEP-2
1490 HGET(275,Y-1)-(279,Y),10:HP
UT(275,Y-1)-(279,Y),9,PSET
1500 IF PEEK(344)=191 THEN 1540
1510 HPUT(275,Y-1)-(279,Y),10
1520 NEXTY
1530 PLAY"O1CCCDCCDDCCD":HPUT(A,
171)-(A+1,175),8,PSET:GOTO1370
1540 B=Y:B1=Y:PLAY"O3DO2DO3EO2EO
3FO2F"
1550 FORZ=1 TO 1000:NEXTZ
1560 HPUT(A,171)-(A+1,175),8,PSE
T:HPUT(275,B-1)-(279,B),10,PSET
1570 RETURN
1580 'DART LOCATION HIT CALCULAT
E
1590 IF A1=220 AND B1=113 THEN 1
720
1600 IF A1>220 THEN A=A1-220 ELS
E A=220-A1
1610 IF B1>113 THEN B=B1-113 ELS
E B=113-B1
1620 R=SQR((A*A)+(B*B)):F=57.295
77951:S=B/R
1630 IF A1>220 AND B1=113 THEN A
=90/F:GOTO1710
1640 IF A1=220 AND B1<113 THEN A
=179/F:GOTO1710
1650 IF A1<220 AND B1=113 THEN A
=270/F:GOTO1710
1660 IF A1=220 AND B1>113 THEN A
=359/F:GOTO1710
1670 IF A1>220 AND B1<113 THEN A
=ATN(S/SQR(-S*S+1))+90/F:GOTO171
0
1680 IF A1<220 AND B1<113 THEN A
=(270/F)-ATN(S/SQR(-S*S+1)):GOTO
1710
1690 IF A1>220 AND B1>113 THEN A
=(90/F)-ATN(S/SQR(-S*S+1)):GOTO1
710
1700 IF A1<220 AND B1>113 THEN A
=(270/F)+ATN(S/SQR(-S*S+1))
1710 Q=INT(((A*F)+10)/18)+1:IFQ=
21 THENQ=1
1720 'DART TEXT HIT
1730 C=HPOINT(A1,B1):HCOLOR6:DL(
DT,1)=A1:DL(DT,2)=B1:DL(DT,3)=C
1740 IFC=0 OR C=12 THEN HPRINT(1
7,23),"YOU MISSED THE BOARD":SOU
ND100,1:GOTO1810
1750 IF C=13 THEN HPRINT(20,23),
"YOU HIT THE WIRE":PLAY"O4GG":HP
UT(G,H)-(G+31,H+8),6,PSET:GOTO18
10
```



```
1760 IF R<3 AND C=14 THEN HPRINT
(15,23),"YOU GOT A ***BULLSEYE**
*":PLAY"T16L4O4CP8EP8GT255":GOTO
1810
1770 IF R<8 AND R>2 THEN HPRINT(
16,23),"YOU HIT DOUBLE BULLSEYE"
:GOTO1810
1780 IF R>26 AND R<30 THEN A$="Y
OU HIT TRIPLE"+STR$(QV(Q)):HPRIN
T(20,23),A$:GOTO1810
1790 IF R<48 AND R>44 THEN A$="Y
OU HIT DOUBLE"+STR$(QV(Q)):HPRIN
T(20,23),A$:GOTO1810
1800 A$="YOU HIT "+STR$(QV(Q)):H
PRINT(20,23),A$
1810 SOUND1,1:I$=INKEY$:CT=0
1820 HSET(A1,B1,RND(15)):FORZ=1T
020:NEXTZ:HSET(A1,B1,C):CT=CT+1:
IF CT=55 THEN1840
1830 I$=INKEY$:IFI$=""THEN1820
1840 HCOLOR0:HLINE(104,183)-(318
,190),PSET,BF
1850 RETURN
1860 'GAME SELECT & SCORE SETUP
SUB
1870 HCOLOR6,0:HPRINT(13,23),"CH
OOSE: A-TACTICS OR B-501"
1880 I$=INKEY$
1890 I$=INKEY$:IF I$=""THEN1890
1900 HLINE(102,182)-(318,190),PR
ESET,BF:SOUND180,1:HCOLOR13,0
1910 IF I$="B" THEN 2110
1920 IF I$<>"A" THEN1870
1930 FORY=63 TO 151 STEP8:HLINE(
72,Y)-(151,Y),PSET:NEXTY
1940 HLINE(80,63)-(88,151),PSET,
B:HLINE(98,64)-(98,159),PSET
1950 HLINE(136,63)-(144,151),PSE
T,B:HLINE(126,64)-(126,159),PSET
1960 HCOLOR12:HPRINT(9,7),"*TACT
ICKS*":FL=77
1970 I$="BLTRDB20":TK(4)=20:TK(5
)=RND(19)
1980 FORX=6 TO 12
1990 Z=RND(19)
2000 FORY=5 TO X-1
2010 IF Z=TK(Y) THEN1990
2020 NEXTY
2030 TK(X)=Z
2040 IF Z<10 THEN I$=I$+"0"+RIGH
T$(STR$(Z),1) ELSE I$=I$+RIGHT$(
STR$(Z),2)
2050 NEXTX
2060 I$=I$+"TT"
2070 FORX=1 TO 23 STEP2
2080 HPRINT(13,7+(X+1)/2),MID$(I
$,X,2)
2090 NEXTX
2100 GOTO2150
2110 HLINE(72,63)-(151,63),PSET:
HLINE(112,63)-(112,159),PSET
2120 HPRINT(9,7),"****501***":FL
=33
2130 HCOLOR12:HPRINT(10,8),"501"
:HPRINT(15,8),"501"
2140 '
2150 RETURN
2160 'ARROW FOR DART SCOREBOARD
2170 FORX=1 TO 3:HSET(DL(X,1),DL
(X,2),10):SOUND60*X,1:NEXTX
2180 IF PT=1 THEN X=62 ELSE X=15
4
2190 S$(1)="R7NH3G3":S$(2)="NE3N
F3R7":GOTO2280
2200 I$=INKEY$
2210 PALETTE10,RND(63):FORZ=1 TO
 66:NEXTZ:PALETTE10,4
2220 IF I$=CHR$(9) THEN 2450
2230 IFI$=""THEN2200
2240 HCOLOR0:HDRAW"XB$;"
2250 IF I$=CHR$(94) AND AP>1 THE
N AP=AP-1:PLAY"O2FF":GOTO2280
2260 IF I$=CHR$(10) AND AP<12 TH
EN AP=AP+1:PLAY"O2FF":GOTO2280
2270 IF I$=CHR$(13) THEN 2310
2280 HCOLOR10
2290 B$="BM"+STR$(X)+","+STR$(((
AP+7)*8)+2)+";"+S$(PT):HDRAW"XB$
;"
2300 GOTO2200
2310 IF AP=12 THEN 2360
2320 IF P(PT,AP)<3 THEN P(PT,AP)
=P(PT,AP)+1:GOSUB2470:GOTO2180
2330 HPRINT(14,23),"INVALID CHOI
CE!!!"
2340 FORZ=1 TO 5:PLAY"O2GBO4BGBG
O2BG":NEXTZ
2350 HCOLOR0:HPRINT(14,23),"INVA
LID CHOICE!!!":GOTO2180
2360 HCOLOR6:HPRINT(14,23),"AMOU
NT?":AM$=""
2370 I$=INKEY$:IFI$=""THEN2370
2380 IF I$=CHR$(13) THEN2410
2390 IF I$=CHR$(8) THEN HCOLOR0:
HPRINT(22,23),AM$:GOTO2360
2400 AM$=AM$+I$:HPRINT(22,23),AM
$:GOTO2370
2410 AM=VAL(AM$)
2420 PLAY"O1CO2DO3EO4FO5G":P(PT,
12)=P(PT,12)+AM
2430 GOSUB2470:HCOLOR0:HLINE(104
,184)-(296,190),PSET,BF
2440 GOTO2180
2450 FORX=1 TO 3:HSET(DL(X,1),DL
(X,2),DL(X,3)):NEXTX:HCOLOR0:HDR
AW"XB$;"
2460 RETURN
2470 'UPDATE TACTICS SCORE
2480 HCOLOR12,15:HLINE(72,152)-(
97,158),PRESET,BF:HLINE(127,152)
-(151,158),PRESET,BF
2490 FORW=1 TO 2
2500 FORX=1 TO 11
2510 IF P(W,X)=0 THEN2530
2520 A$=STRING$(P(W,X),"*"):HPRI
NT(9+(W-1)*7,7+X),A$
2530 NEXTX
2540 A$=STR$(P(W,12)):A=LEN(A$)-
1:A$=RIGHT$(A$,A)
2550 IF LEN(A$)<3 THEN A$="0"+A$
:GOTO2550
2560 HPRINT(9+(W-1)*7,19),A$
2570 NEXTW
2580 PLAY"O3CFFFFF":HCOLOR0:HDRA
W"XB$;"
2590 RETURN
2600 '501 SCORE UPDATE
2610 FORX=1 TO 3:HSET(DL(X,1),DL
(X,2),10):SOUND62*X,1:NEXTX
2620 HCOLOR6,0:HPRINT(14,23),"AM
OUNT?":AM$=""
2630 I$=INKEY$:PALETTE10,RND(63)
:IFI$=""THEN2630
2640 IF I$=CHR$(13) THEN2680
2650 IF I$=CHR$(8) THEN HCOLOR0:
HPRINT(22,23),AM$:GOTO2620
2660 AM$=AM$+I$:HPRINT(22,23),AM
$:GOTO2630
2670 IF PF(PT,2)<0 THEN PF(PT,2)
=PF(PT,2)+AM:AM=0:AM$="0":SOUND1
82,2:SOUND47,1
2680 IF AM$="" OR VAL(AM$)=0 THE
N HCOLOR0:HLINE(110,184)-(250,19
0),PSET,BF:GOTO2810
2690 AM=VAL(AM$):PLAY"O1CCO2DDO3
EEO4FFO5GG":PF(PT,2)=PF(PT,2)-AM
2700 IF LEN(AM$)<3 THEN AM$=" "+
AM$:GOTO2700
2710 HLINE(110,184)-(250,190),PR
ESET,BF
```



```
2720 HCOLOR12,15:HPRINT(10+(PT-1
)*5,PF(PT,1)+7),AM$:IFPF(PT,1)=1
 THEN2800
2730 X=76+(PT-1)*40:Y=PF(PT,1)*8
+63:HLINE(X,Y)-(X+32,Y),PSET
2740 PF(PT,1)=PF(PT,1)+1:AM$=STR
$(PF(PT,2)):X=LEN(AM$)-1:AM$=RIG
HT$(AM$,X)
2750 IF LEN(AM$)<3 THEN AM$=" "+
AM$:GOTO2750
2760 HPRINT(10+(PT-1)*5,PF(PT,1)
+7),AM$:PF(PT,1)=PF(PT,1)+1
2770 IF PF(PT,1)>=11 THEN2780 EL
SE2810
2780 X=73+(PT-1)*40:Y=64:FORZZ=1
 TO 2000:NEXTZZ:SOUND202,1:HLINE
(X,Y)-(X+38,Y+94),PRESET,BF
2790 PF(PT,1)=1:GOTO2760
2800 PF(PT,1)=PF(PT,1)+1
2810 FORX=1 TO 3:HSET(DL(X,1),DL
(X,2),DL(X,3)):SOUND255-(X*60),1
:NEXTX
2820 RETURN
2830 'END SUB
2840 HCOLOR7,6:HLINE(142,14)-(18
5,33),PRESET,BF:HLINE(141,13)-(1
86,34),PSET,B
2850 HCOLOR1:HPRINT(18,2),"QUIT?
":HPRINT(18,3),"(Y/N)"
2860 I$=INKEY$:IF I$="" THEN2860
2870 IF I$="Y" THEN 2882
2880 IF I$="N" THEN HCOLOR0:HLIN
E(141,13)-(186,34),PSET,BF:PLAY"
O4BAGFEDC":RETURN
2881 SOUND11,5:GOTO2860
2882 HCOLOR7,6:HLINE(118,14)-(20
9,33),PRESET,BF:HLINE(117,13)-(2
10,34),PSET,B
2883 HCOLOR1:HPRINT(15,2),"PLAY
AGAIN?":HPRINT(18,3),"(Y/N)"
2884 I$=INKEY$:IFI$=""THEN2884
2885 IF I$="Y" THEN2888
2886 IF I$="N" THEN2909
2887 SOUND5,5:GOTO2884
2888 FORX=1 TO 2
2889 AM(X,1)=0:PF(X,1)=2:PF(X,2)
=501
2890 FORY=1 TO 12
2891 P(X,Y)=0
2892 NEXTY,X
2893 HCOLOR0:HLINE(117,13)-(210,
34),PSET,BF
2894 HCOLOR0:HLINE(106,183)-(312
,190),PSET,BF
2895 HCOLOR15:HLINE(72,56)-(151,
159),PSET,BF
2900 GOTO1270
2909 FORX=1 TO 15:SOUND255-(X*10
),5:PALETTEX,0:NEXTX
2910 HCLS0:PALETTE0,0:HGET(0,87)
-(54,95),1:HCOLOR1:HPRINT(0,11),
"THE END"
2920 HGET(0,87)-(54,95),2:HPUT(0
,87)-(54,95),1,PSET
2930 PI=57.29577951:R=90:PALETTE
1,36
2940 FORZ=0 TO 360 STEP6
2950 W=Z/PI:X=160-SIN(W)*R:Y=96-
COS(W)*R:R=R-1
2960 HPUT(X,Y)-(X+54,Y+8),2,PSET
2970 NEXTZ
2980 FORX=0 TO 200:PALETTE1,RND(
16)+31:NEXTX
2990 POKE65496,0:WIDTH32:CLS1:RG
B:END
3000 'TITLE
3010 FORX=0 TO 7:PALETTEX,0:NEXT
X
3020 HCLS1:HCOLOR0:HLINE(0,0)-(3
19,191),PSET,B:A=0
3030 FORX=15 TO 304 STEP15
3040 Z=X+RND(5)-3:Y=RND(180)+10:
HLINE(Z,0)-(Z,191),PSET
3050 HLINE(A,Y)-(Z,Y),PSET:A=Z
3060 NEXTX
3070 FORX=0 TO 333:HSET(RND(319)
,RND(191),0):NEXTX
3080 A$="U11R2F3D5G3L2BR8;U9E2R1
F2D3NL5D6BR3;U11R4F1D3G2NL3F2D3B
R6;U11NL3R3BM+8,+1;H1L3G1D3F1R3F
1D4G1L3H1"
3090 Y=120:C=3:Z=Y
3100 FORX=50 TO 60
3110 B$="BM"+STR$(X)+","+STR$(Z)
+";C"+STR$(C)+";"+A$
3120 HDRAW"S24;XB$;"
3130 C=C+1:IFC>7 THENC=3
3140 Y=Y+.5:Z=INT(Y)
3150 NEXTX
3160 HCOLOR7:HPRINT(14,18),"BY M
ARK WEBB"
3170 HPRINT(16,19),"(C) 1990"
3180 PALETTE1,35:PALETTE2,36:PAL
ETTE3,16:PALETTE4,9:PALETTE5,36:
PALETTE6,44:PALETTE7,54
3190 EXEC44539
3200 HDRAW"S4;"
3210 GOTO110
```

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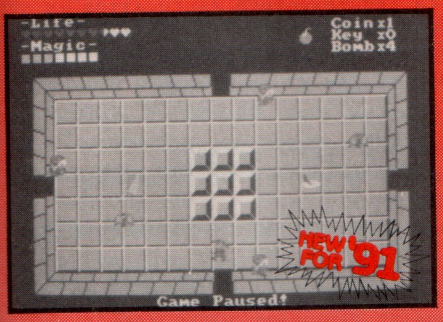
The Quest for THELDA



Better men than you have failed the quest, but the hand of the good princess Thelda is too much to resist! Stolen by the evil necromancer Divinax, she has been secreted far from prying eyes and it is now up to you to regain the pieces of the mystical Life Force and save the fair lady. The Quest for Thelda is an outstanding arcade program that combines action and adventure to bring you an incredible video game playing experience. Travel throughout over 500 different screens searching for magical objects and spells, fighting horrible creatures, and gathering the various parts of the Life Force guarded by ever-increasing terrors. You'll enjoy the highest quality 320x200 resolution 16 color graphics and digital sound effects that you've come to expect from Sundog Systems. The game play is fast and furious, and only you can rescue the princess and complete the **LEGEND OF THELDA!** Req. 128K CoCo 3, disk drive, and joystick (2-button joystick supported).

$34.95

Hint book now available for Thelda! Contains clues, maps, and even a BASIC program to modify your own characters! **$4.95**

Zenix

You have been chosen to pilot the spacecraft wielding the plutonium plasma laser against the nefarious insectoids, the Zenians. These bugs have been ripping off the space trade lines for years; now they're about to find a victim who can fight back! Beat back the swarm of pests to their home planet Zenix, and use the laser to end the menace once and for all. Zenix is a lightning fast arcade game for the 128K CoCo 3. The 320x225 16 color graphics are amazing, as are the digital background music score and effects, all on a 128K computer! The fast action and game play will astound you in this GALAGA of extermination. Plug in your joystick and strap in for the ride of your life! Call to order a demo disk to see the action before you buy! Req. 128K CoCo 3, disk drive, and joystick.

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★ THE CONTRAS ★

In the year 2671, a mysterious object landed on Earth, heralding the alien invasion of the Red Falcon. Only two courageous soldiers have a hope of stemming this alien infestation. Armed with your military training and the latest weapon technology, you and a friend must fight back the horde. Sundog Systems presents our second 512K game, **The Contras.** You'll see why we decided to use 512K on this project! Amazing graphics with 320x225 resolution, 16 color full screen animation and horizontal smooth scrolling! Background digital sound effects and real-time music! One or two player action AT THE SAME TIME! You'll agree that this is one of the best arcade games yet for your 512K CoCo 3. Needless to say, playing hero won't be easy; playing The Contras will be tougher! Req. 512K CoCo 3, disk drive, and 2-button joystick.

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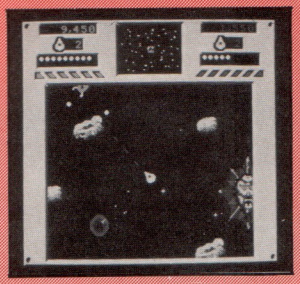
Crystal City

The superior technology of the evil Overlords has ensnared yet another innocent planet; however, this one contains the Crystal City, bastion of democracy and independence. Earth has had enough! Break through level upon level of their virtually invulnerable defenses, defeat the end guardians, and make your way ever closer to freeing the slaves of the Crystal City! This amazing arcade game is an achievement in its own right. Full 128K/512K utilization! Super fast horizontal hardware scrolling on the 128K computer! Wild digital sound effects and background music score! 30 minutes, or over 30 megabytes, of non-repeating 320x200 resolution, 16 color graphics! This game has it all; order a demo disk to see it first! Can you save the Crystal City from unbeatable foes? Req. 128K CoCo 3, disk drive, and joystick.

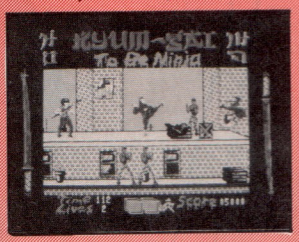
$34.95

SinistaaR



You've raved about this 512K arcade game! The graphics and animation are amazing! You've got to hear the digital sounds! 512K (three disks) packed with excitement. 512K CoCo 3 only. $34.95

KYUM-SAI To Be NINJA



This martial arts arcade game remains a CoCo 3 phenomenon. One of our best sellers to date! Play the incredible combat experience that you've been missing, and call for the availability of the OS-9 version. 128K CoCo 3 action. $29.95.

OS-9 Version Now Available

SOUNDTRAX

This 128K/512K sound sequencing system has become an immensely popular program. Create musical scores using polyphonic digitized sounds and a user-friendly point and click editor. Call to order the SoundTrax demo program, and get 10% off your purchase with receipt. $34.95

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Body Mass

by Bob Teague

In his book *How to Be Your Own Nutritionist*, Stuart M. Berger, M.D., uses a body-mass worksheet from a recent report by the National Institute of Health to help readers determine if they are underweight, at optimal weight, are overweight, or are obese. Since everyone is more health-conscious today, I decided to write a simple program to perform the necessary arithmetic. As the computer proficiency instructor at the high school where I teach, I use the program to demonstrate some of the basics of BASIC to my students.

Since, according to Dr. Berger, only one in five Americans fall into their correct weight range, I thought RAINBOW readers might enjoy using their CoCos to help them shape up. With three out of five Americans in the overweight and obese range, there should be a few readers who should use this program to perhaps change their current lifestyle.

The Listing: BODYMASS

```
10 'BODY MASS
20 'WRITTEN BY BOB TEAGUE
30 'COPYRIGHT FEBRUARY 1991
40 'BY FALSOFT, INC.
50 'RAINBOW MAGAZINE
60 CLS
70 PRINT TAB(5);"BODY MASS WORKS
HEET"
80 PRINT:PRINT
90 INPUT"ENTER SEX (M/F)";S$
100 INPUT"ENTER WEIGHT IN LBS.";
W
110 INPUT"ENTER HEIGHT IN IN.";H
120 REM CONVERT TO METRIC SYSTEM
130 W=W/2.2
140 H=H/39.4
150 F=H^2
160 M=W/F
170 PRINT
180 PRINT"BODY MASS=";M
190 M=INT(M+.5):'ROUND OFF
200 PRINT
210 REM EVALUATION ROUTINE
220 IF S$="F" THEN GOSUB 290
230 IF S$="M" THEN GOSUB 360
240 PRINT
250 INPUT"ANOTHER CALCULATION (Y
/N)";C$
260 IF C$="Y" THEN RUN
270 IF C$="N" THEN END
280 IF C$<>"Y" OR C$<>"N" THEN G
OTO 240
290 REM FEMALE RATINGS
300 IF M<20 THEN PRINT"UNDERWEIG
HT"
310 IF M>=20 AND M<=23 THEN PRIN
T"OPTIMAL WEIGHT"
320 IF M>=24 AND M<=26 THEN PRIN
T"SLIGHTLY OVERWEIGHT"
330 IF M>=27 AND M<=31 THEN PRIN
T"OVERWEIGHT"
340 IF M>31 THEN PRINT"OBESE"
350 RETURN
360 REM MALE RATINGS
370 IF M<21 THEN PRINT"UNDERWEIG
HT"
380 IF M>=21 AND M<=24 THEN PRIN
T"OPTIMAL WEIGHT"
390 IF M>=25 AND M<=27 THEN PRIN
T"SLIGHTLY OVERWEIGHT"
400 IF M>=28 AND M<=31 THEN PRIN
T"OVERWEIGHT"
410 IF M>31 THEN PRINT"OBESE"
420 RETURN
```

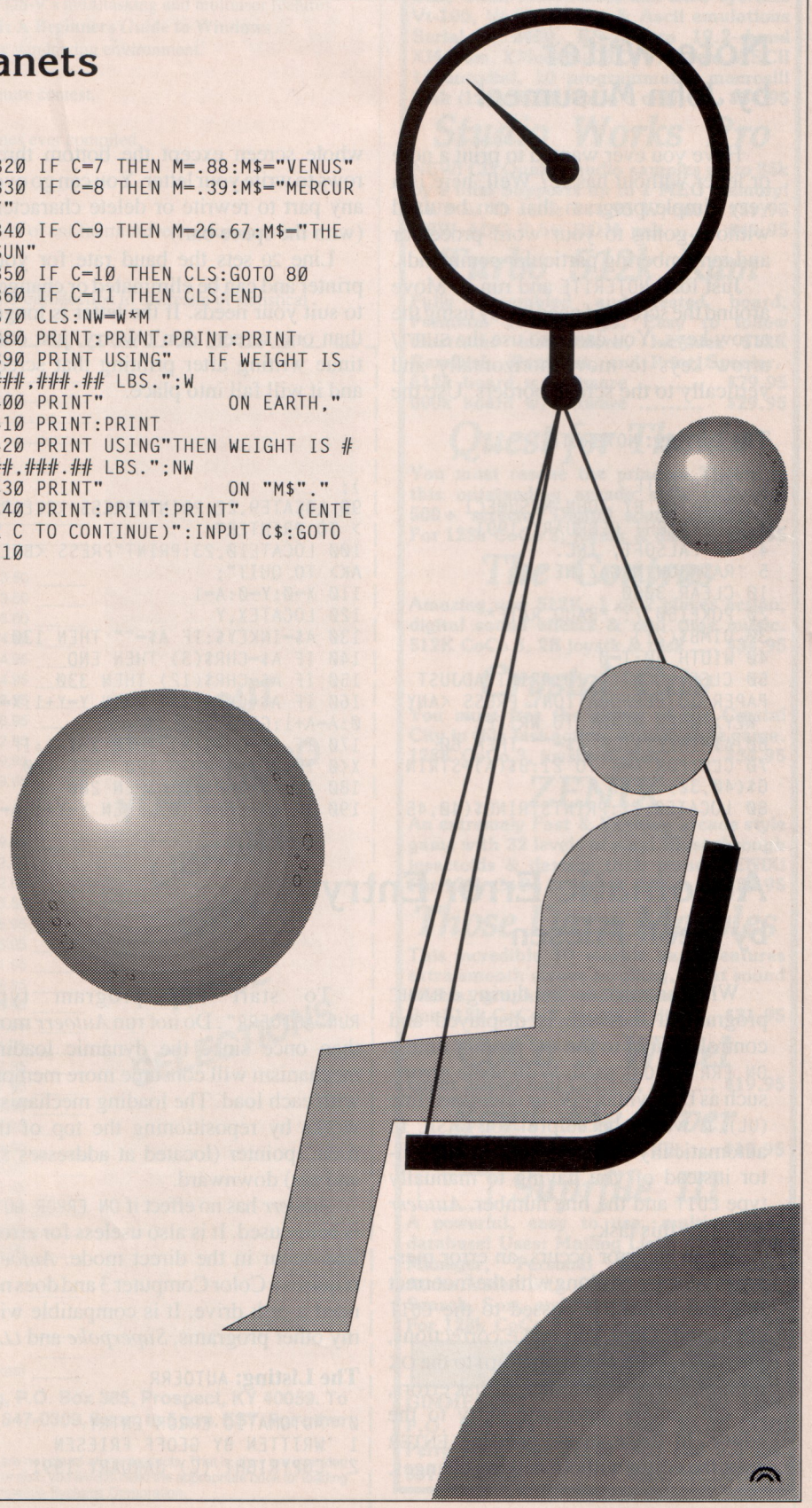
Weights on Other Planets

by Richard Barberian, Jr.

Have you ever wondered how much you would weigh on Mars or Saturn? With this program, your weight can be computed for each of these planets as well as other heavenly bodies, such as the moon or the sun! Enter your own weight, or someone else's, and you'll be amazed and sometimes shocked at what you would weigh in other areas of the galaxy. Just for the fun of it, you might even want to enter the weight of inanimate objects, such as a 1-lb. box of candy or your car!

The Listing: WEIGHTS

```
10 'WEIGHTS ON OTHER PLANETS
20 'WRITTEN BY RICHARD BARBERIAN
30 'COPYRIGHT FEBRUARY 1991
40 'BY FALSOFT, INC.
45 'RAINBOW MAGAZINE
50 DIM M$(20),A$(2)
60 CLS
70 PRINT"    WEIGHTS ON OTHER PL
ANETS"
80 PRINT:PRINT:PRINT:
90 PRINT"ENTER A GIVEN WEIGHT (I
N LBS.)"
100 INPUT W
110 CLS
120 PRINT"MAKE A CHOICE TO DETER
MINE"
130 PRINT"WEIGHT ON THE SELECTED
 PLANET"
140 PRINT:PRINT"   1. THE MOON"
150 PRINT"   2. PLUTO"
160 PRINT"   3. URANUS"
170 PRINT"   4. SATURN"
180 PRINT"   5. JUPITER"
190 PRINT"   6. MARS"
200 PRINT"   7. VENUS"
210 PRINT"   8. MERCURY"
220 PRINT"   9. THE SUN"
230 PRINT"  10. ENTER A NEW WEIG
HT"
240 PRINT"  11. END"
250 INPUT C
260 IF C=1 THEN M=.16:M$="THE MO
ON"
270 IF C=2 THEN M=.04:M$="PLUTO"
280 IF C=3 THEN M=.79:M$="URANUS
"
290 IF C=4 THEN M=.93:M$="SATURN
"
300 IF C=5 THEN M=2.34:M$="JUPIT
ER"
310 IF C=6 THEN M=.38:M$="MARS"
320 IF C=7 THEN M=.88:M$="VENUS"
330 IF C=8 THEN M=.39:M$="MERCUR
Y"
340 IF C=9 THEN M=26.67:M$="THE
SUN"
350 IF C=10 THEN CLS:GOTO 80
360 IF C=11 THEN CLS:END
370 CLS:NW=W*M
380 PRINT:PRINT:PRINT:PRINT
390 PRINT USING"   IF WEIGHT IS
###,###.## LBS.";W
400 PRINT"           ON EARTH,"
410 PRINT:PRINT
420 PRINT USING"THEN WEIGHT IS #
##,###.## LBS.";NW
430 PRINT"           ON "M$"."
440 PRINT:PRINT:PRINT"     (ENTE
R C TO CONTINUE)":INPUT C$:GOTO
110
```



Novices Niche

Note Writer
by John Musumeci

Have you ever wanted to print a note or letter without hassle? Well, here is a very simple program that can be used without going to your word processor and remembering particular commands.

Just load NOTERITE and run it. Move around the screen, if need be, by using the arrow keys. You can also use the SHIFT/ arrow keys to move horizontally and vertically to the screen borders. Use the whole screen except the bottom three rows to write your letter. You can go over any part to rewrite or delete characters (with the space bar.)

Line 20 sets the baud rate for your printer and can be eliminated or changed to suit your needs. If the letter is longer than one screen, don't worry, just continue writing after printing that screen and it will fall into place.

The Listing: NOTERITE

```
1 'NOTE RITE
2 'WRITTEN BY JOHN MUSUMECI
3 'COPYRIGHT FEBRUARY 1991
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 CLEAR 3000
20 POKE150,7:'*BAUD RATE*
30 DIMB$(21)
40 WIDTH 40:T=0
50 CLS5:LOCATE5,10:PRINT"ADJUST
PAPER TO PERFORATION. PRESS <ANY
 KEY> WHEN READY TO WRITE."
60 A$=INKEY$:IF A$="" THEN 60
70 CLS:FOR A=1 TO 21:B$(A)=STRIN
G$(40,32):NEXT A
80 LOCATE0,21:PRINTSTRING$(40,45
);
90 LOCATE9,22:PRINT"PRESS <CLEAR
> TO PRINTER"
100 LOCATE10,23:PRINT"PRESS <BRE
AK> TO QUIT";
110 X=0:Y=0:A=1
120 LOCATEX,Y
130 A$=INKEY$:IF A$="" THEN 130
140 IF A$=CHR$(3) THEN END
150 IF A$=CHR$(12) THEN 330
160 IF A$=CHR$(13) THEN Y=Y+1:X=
0:A=A+1:GOTO 290
170 IF A$=CHR$(8) THEN X=X-1:IF
X<0 THEN X=0:GOTO 120 ELSE 120
180 IF A$=CHR$(9) THEN 280
190 IF A$=CHR$(10) THEN Y=Y+1:A=
A+1:IF Y>20 THEN Y=20:A=21:GOTO
120 ELSE 120
200 IF A$=CHR$(94) THEN Y=Y-1:A=
A-1:IF Y<0 THEN Y=0:A=1:GOTO 120
 ELSE 120
210 IF A$=CHR$(21) THEN X=0:GOTO
 120
220 IF A$=CHR$(93) THEN X=39:GOT
O 120
230 IF A$=CHR$(91) THEN Y=20:A=2
1:GOTO 120
240 IF A$=CHR$(95) THEN Y=0:A=1:
GOTO 120
250 GOSUB 310
260 MID$(B$(A),X+1,1)=A$
270 LOCATE0,Y:PRINTB$(A);
280 X=X+1:IF X>39 THEN A=A+1:Y=Y
+1:X=0
290 GOSUB 310
300 GOTO 120
310 IF Y>20 THEN Y=20:A=21
320 RETURN
330 LOCATE9,22:PRINT"  P R I N T
 I N G . ."
340 IF T=0 THEN FOR X=1 TO 12:PR
INT#-2:NEXT X:T=1:AA=0:GOTO 360
350 IF AA=1 THEN FOR X=1 TO 24:P
RINT#-2:NEXT X:AA=0 ELSE AA=1
360 FOR X=1 TO 21:PRINT#-2,TAB(2
0);B$(X):NEXT X
370 GOTO 70
```

Automatic Error Entry
by Geoff Friesen

When an error occurs during a BASIC program, a message is displayed and control returns to the OK prompt unless ON ERR GOTO is used. With some errors, such as bad syntax (SN) or undefined line (UL), it would be helpful for BASIC to automatically enter the built-in line editor instead of you having to manually type EDIT and the line number. *Autoerr* performs this task.

When an error occurs, an error message is displayed along with the incorrect line and control is passed to the EDIT command. Once you make corrections, pressing ENTER causes a return to the OK prompt. Some errors, such as disk errors, do not require automatic entry to the editor. In these cases, pressing ENTER exits the editor without making changes.

To start this program type RUN"AUTOERR". Do not run *Autoerr* more than once since the dynamic loading mechanism will consume more memory with each load. The loading mechanism works by repositioning the top of the BASIC pointer (located at addresses $27 and $28) downward.

Autoerr has no effect if ON ERROR GOTO is being used. It is also useless for errors that occur in the direct mode. *Autoerr* requires a Color Computer 3 and does not need a disk drive. It is compatible with my other programs, *Superpoke* and *LLR*.

The Listing: AUTOERR

```
0 'AUTOMATIC ERROR ENTRY
1 'WRITTEN BY GEOFF FRIESEN
2 'COPYRIGHT (C) JANUARY 1991
3 'BY FALSOFT, INC.
100 '-----------------
110 'AUTOERR
120 '
130 '(C) 1990, RAINBOW
140 '-----------------
150 '
160 CLEAR 200,PEEK(&H27)*256+PEE
K(&H28)-20
170 SA=PEEK(&H27)*256
180 SA=SA+PEEK(&H28)+1
190 FOR I=SA TO SA+20
200 READ B$
210 POKE I,VAL("&H"+B$)
220 NEXT I
230 DATA 96,68,4C,26,03,7E,AC,73
240 DATA BD,BD,C5,BD,B9,5C,DC,68
250 DATA DD,2B,7E,85,36
260 POKE &HAC6B,126
270 POKE &HAC6C,SA/256
280 POKE &HAC6D,SA AND 255
290 WIDTH 32
300 PRINT "AUTOERR INSTALLED"
```

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Disk Drive Power

by Marty Goodman
Contributing Editor

Do disk drives require 12 volts for their motors? Are there any that require just 5 volts for both the motors and logic?

R. Coates
Sandy Hook, Manitoba

All 5¼-inch drives I have seen require a regulated source of 12 volts for their motors in addition to a regulated source of 5 volts for their logic boards. Some of the very newest 1.44-Meg, 3½-inch drives, including one from Toshiba, use a single 5-volt source for all their needs. I do not know if they use a 5-volt motor or if they have some kind of voltage converter onboard. I suspect the former.

RS-232 Pak (ACIA) Speed

The 6551 chip in the Tandy RS-232 Pak is rated to operate up to 1 MHz. Is this a problem when using the RS-232 Pak under OS-9 Level II at 2 MHz?

Paul McKay (PAULMCKAY)
Asked on Delphi

I have seen few reports of problems with the RS-232 Pak when used under OS-9 Level II since the 6551 chip in the Pak was replaced with a 6551A chip (rated for 2-MHz operation). If I had problems with my RS-232 Pak under OS-9, I would test the pack under Disk BASIC at 1 MHz with a Disk BASIC-based terminal program, or I would artificially slow OS-9 to 1-MHz operation via a poke from BASIC09 and see if the problem went away. If the problem disappears, buy a 6551A chip and install it. Note that on some models of Tandy RS-232 Pak, the 6551 chip is soldered directly to the board and replacement requires skill in desoldering 28-pin chips. Many of the packs made by third parties, such as Disto and Orion, use 6551A chips when delivered and do not have this problem. If you are uncertain about what version of 6551 chip is in your RS-232 Pak, open it up and look at the chip. It will be either a 6551 (1-MHz rated) or a 6551A (2 MHz). Note, too, that most folks report their 1-MHz rated 6551 chips work fine at 2 MHz under OS-9 Level II.

Drives Laying Down on the Job

Is there any problem with laying a vertically mounted disk drive system on its side? Are there any problems related to the system's proximity to a TV?

Kellie Gore
Pace, Florida

Disk drives are made to operate either vertically or horizontally so, barring some weird internal problem like a loose wire in the case, it should not matter if you lay your vertically mounted case on its side. And it should not matter if your disk drive is near your TV, though this placement could result in added RF interference and distortion of the TV image. It is possible that some older TV sets with a very big power transformer near the disk drive cabinet could affect disk operation.

New Colors for Older Games

Is there a program that will help me play games like Ghana Bwana, Pitstop *and* Doubleback *on my CoCo 3?*

Steven W. Penrod
York, Pennsylvania

Delphi has a program by Steve Bjork that converts *Ghana Bwana* and a few of his other games for the CoCo 3. *Doubleback* is a ROM pack that uses the Hi-Res mode of the CoCo 1 and 2. First convert it to disk operation, then use *RGB FIX* (sold by Microcom) to convert the color set. I don't know about *Pitstop*, but many old CoCo 2 games run fine on the CoCo 3 once the color set has been converted with *RGB FIX*.

Sony Cable/Disk Zapping

Will the Sony monitor cable sold by Microcom for the Sony KV1311CR TV work on a Sony KV 25-inch XBR TV? Also, is there a disk utility that automates the recovery of damaged disk directories and that fully supports 40-track disk formats under Disk BASIC? How about recovering killed files?

W. Sanders
Chula Vista, California

I designed and built the Sony cable sold by Microcom and Howard Medical. It should work fine with the Sony 25-inch XBR TV provided the TV has a Sony-standard, 34-pin, dual-in-line analog RGB port. Note that the Sony 25-inch XBR TV probably supplies +5 volts on pins 1 and 2 of its 34-pin connector so you can, and probably should, modify my cable to get its source of +5 volts from the monitor's pins 1 and 2 and not from the joystick port.

If a given disk sector is crashed, there is no way to recover what was on it. A long time ago I wrote a program to analyze the disk directory and print all the relevant information from the directory and Granule Allocation Table (GAT). This program was published in THE RAINBOW many years ago. It might be helpful in recovering disk files if the directory is intact, but the granule allocation table is lost. Still, if the file was longer than one granule, you would have to pick through the GAT by hand, matching one granule with the next. There

---

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW's CoCo SIG and database manager of OS-9 Online. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

is no way to effectively automate this process if the GAT is gone. In theory it would not be hard to devise a simple BASIC program to analyze a GAT where the directory track was smashed and group all related granules together in a list. I don't know of any such program. *KDisk* is a shareware program (available on Delphi) that can "zap" 40-track disks. I highly recommend it.

Recovery of killed files is quite impossible to fully automate since all trace of the first granule of that file on the disk is destroyed. Of course, it might be helpful to have a program that analyzed the GAT and found all free granules and then, one by one, displayed them for your enjoyment. Right now I know of no such aid. You have to do this by hand with a disk-zap program.

Installing SmartWatch

Can I install the Tandy SmartWatch in the 28-pin socket in my FD-500 disk controller that currently houses the 1773 disk controller chip?

David Raspberry (DAVERAZZ)
Cleveland, Ohio

No! The SmartWatch is meant for installation only under 28-pin ROMs or EPROMs. The pin-out of the disk controller chip is completely different from any ROM. The 1773 chip does not even use the same lines as the ROM chip. The FD-500 uses a 24-pin ROM chip. You might consider burning your Disk BASIC into a 2764 EPROM and purchase a 24- to 28-pin adapter from Art Flexser of SpectroSystems. Piggyback the adapter, the SmartWatch and the EPROM. The problem is that such a tower of adapters might cause problems with physically fitting the controller into the CoCo or Multi-Pak slot.

Mapping Memory

Can you provide a memory map for the Color Computer's I/O space?

Jason Bucata (JBUCATA)
Ferndale, Michigan

Because so many third-party devices have been made for the CoCo over the last 10 years, I can't begin to give you a complete map. But I can provide you with a fair amount of useful information.

The I/O page for the CoCo is limited to addresses $FF00 thru $FFEF. However, most of this is unavailable for use due to ports reserved for the disk controller, the keyboard PIA and the other PIA chip on board, the GIME chip, the Multi-Pak and SAM/VDG register emulation. The I/O page is also limited due to wasteful decoding that ghosts (duplicates) many of the internal ports.

Addresses used by the CoCo and wasted by ghosting are in the range $FF00 through $FF1F. The keyboard PIA is mapped to ports $FF00 through $FF03. And all ports from $FF00 through $FF1F are wasted due to sloppy decoding in the CoCo 1 and 2. I believe that in the CoCo 3 you have ports at $FF10 through $FF1F to play with, and possible decoding via an unused line on the 74LS138 chip in the machine.

At addresses $FF20 through $FF3F, the 6821 PIA chip services the joystick and cassette ports, and the bit-banger serial port. This PIA is mapped to addresses $FF20 through $FF23. On the CoCo 1 and 2 those ports are ghosted through $FF3F which wastes that entire 32-byte block of I/O ports. With the CoCo 3, you have access to ports $FF30 through $FF3F and may be able to select them via an unused line on the 74LS138 chip.

Adresses $FF40 through $FF5F are selected when the *SCS line goes Low and are usually used to control the disk controller card. Specifically the Tandy-type disk controller uses $FF40 to control drive select, motor on, double-density enable, wait enable and write-precompensation enable. These controllers also use ports at $FF48 through $FF4B to communicate with the floppy disk-controller chip. Most disk controllers ghost those ports in the $FF50 through $FF5F region, making those 16 addresses unusable. Most Disto products further decode the *SCS line to limit disk-controller ports to $FF40 through $FF4F and then use the range of $FF50 through $FF5F for control of Mini-bus functions, such as a hard drive port, an RS-232 port, a parallel port, a real-time clock and an EPROM programmer. Some other third-party hard-drive host adapters also use ports in this range, but they must use a Multi-Pak to switch the *SCS line between the standard disk controller and the host adapter.

Addresses $FF60 through $FF7E are available for general purpose third-party I/O ports. In this range, stay away from $FF68 through $FF6F since these 8 bytes are pretty much reserved by convention for one of two 6551 chips mapped to act as hardware serial ports. The normal Tandy RS-232 Pak is mapped to $FF68 through $FF6B. The Tandy Modem Pak and third-party second serial ports (other than Disto Mini-bus products) are mapped to $FF6C through $FF6F. Various Tandy and third-party products have previously used this range for different purposes. For example, the all but forgotten Tandy X-Pad uses ports at $FF60 through $FF63. Speech Systems products used ports in the $FF70 through $FF7E range for its Stereo Pak, SC-01 Voice device and Ears.

$FF7F is reserved for switching *SCS, *CTS and *CART among the four slots in the Multi-Pak Interface. Addresses $FF80 through $FFEF are used in CoCo 3 for GIME chip functions and for emulation of the VDG and SAM chips. On the old CoCo 1 and 2, which had no GIME chip, ports at $FF80 through $FFBF were available to, and sometimes used by, third-party devices. Ports at $FFC0 and up were used for VDG and SAM control. $FFF0 through $FFFF are reserved for CoCo interrupt and reset vectors.

As you can see there are only 23 unused ports available in the $FF60 through $FF7F range (since $FF68 through $FF6F and $FF7F are reserved). If you need more ports, you must consider a multiplexing scheme. If you are a hacker making a one-of-a-kind device, there are various sneaky tricks to gaining extra ports. For example, try piggybacking on top of existing PIA chips and using a single inverter gate to decode for the second PIA chip. On the CoCo 3 the high-order four bits on the port of the 68B21 PIA chip mapped to $FF22 can be used as inputs due to an ideosyncrasy involving the conversion from use of a VDG and SAM chip in the CoCo 1 and 2 to the use of the GIME chip to control video modes.

Printer Substitutions

I have an IBM Prowriter I want to substitute for my DMP-110. But when I hook it up to my CoCo 3 via a Metric Industries serial-to-parallel interface it will not print, even though it self-tests fine. Can you help?

Richard Ford
Ponte Vedra Beach, Florida

I am not familiar specifically with the Prowriter. Check to see if it supplies +5 volts on Pin 18 of its parallel connector. If not, get an external power supply for your Metric Industries converter and move an

DB-25	DB-9	Function	
8	1	Carrier Detect	(DCD)
3	2	Receive Data	(RXD)
2	3	Transmit Data	(TXD)
20	4	Data Terminal Ready	(DTR)
7	5	Ground	(GND)
6	6	Data Set Ready	(DSR)
4	7	Request To Send	(RTS)
5	8	Clear To Send	(CTS)
22	9	Ring Indicator	(RI)

To make a null-modem cable for use with the 4-pin serial port:

CoCo 4-pin DIN	PC-Compatible Serial port
1	DTR, DSR and DDD
2	TXD
3	Ground (GND)
4	RXD

Also, hook RTS to CTS on the PC-compatible side.

Table 1: Pinouts for Serial Cable

internal jumper to tell it to accept internal power. For further instruction, consult the documentation or Metric Industries.

Foreign Disks

Does anyone know of a program that allows a CoCo to read and write Commodore 64 and Apple II disks?

Kent Pirkle (KPIRKLE)
Cumming, Georgia

The Apple II and the earlier Commodore 64 drives used group-coded records to place data on the disk. This is, at the hardware level, quite a different approach than the modified-frequency modulation (MFM) used by CoCo and IBM disk systems. For this reason, it is physically impossible with standard CoCo or IBM disk hardware for the CoCo or an IBM compatible to read, format or write Apple II and older Commodore 64 disks. When transferring files from one of those machines to or from a CoCo or IBM PC, your best bet is to use the serial ports on both computers, a null-modem cable, and then send the data between the two computers using a terminal emulator program running on each machine. If the two computers are physically distant so that a null-modem cable will not work, you can upload the file from one computer to your Workspace on Delphi (or other BBS), then later download the file using the other computer. Note that some Commodore word processors use PETASCII, a variant of ASCII in which the encoding of lowercase and uppercase letters is reversed. If you encounter PETASCII files, you may have to write a little BASIC converter program to reverse upper- and lowercase. Lonnie McClure (LMCCLURE) of Kentucky tells me that some later model Commodore drives used MFM encoding, and in theory you could read and write those disks using CoCo hardware. However, I know of no IBM or CoCo program that supports this format.

Of Capacitors and Keyboards

What are the values of C65 and C66, the two little capacitors I clipped off when I upgraded a CoCo 3 to 512K? I need to know so I can re-install them while temporarily downgrading a CoCo 3 to 128K. Also, my old CoCo 3 recently went bad, with key entries randomly occurring even though I was not using the keyboard. Any ideas on how to fix this? I must confess, I am using a Marty Goodman keyboard-extender cable sold by Microcom and may have zapped the machine through that cable with a static discharge.

Jim Hawerbier (JIMHOW)
Elmhurst, Illinois

The value of C65 is 82 pF and the value of C66 is 27 pF. Anything reasonably close to these values (plus or minus 15 percent) is fine. However, note that in my experience a CoCo 3 with those caps clipped off worked fine when downgraded to 128K. There is no apparent need to replace the caps, especially if you are only temporarily downgrading the machine and you experience no problems after using this advice.

The keyboard problem you report is likely to be caused by a bad keyboard PIA chip. This is the 40-pin chip located right next to the 68B21 chip. Replacements are available from Tandy National Parts. You have to desolder the old keyboard PIA chip, which is a tedious and delicate matter accomplished best by clipping each of the old chip's pins, then individually pulling them out using a soldering iron and long nosed pliers. Be sure to install a socket after removing the old chip! One Delphi member recently reported a keyboard problem caused by a bad 74LS30 (keyboard-interrupt generator) chip. In your case, however, I would tend to first suspect the keyboard PIA chip. In the future, remember to have your remote keyboard in a case so you cannot touch the cable that goes to it from the keyboard connection.

The 4-Pin to 9-Pin Connection

How do I make a null-modem cable for hooking my CoCo's 4-pin serial port to my IBM AT's 9-pin DB port?

Steve Flock (THEJAILER)
Vancouver, Washington

Here is some very general reference information that should help you with this and other problems. There are two very common standard types of connectors used with RS-232 serial ports on PC compatibles. One type of connector is a male DB-25 connector, used on older XT clones and some more recent computers. The other type of connector is a male DB-9 connector used on many AT and 386 machines as well as on many lap-top PC-compatible computers. The pinout of those connectors is shown in Table 1.

A cable made like this should work fine as a null-modem cable. I hope this proves helpful to others who are confused about the two standards in PC-compatible serial ports.

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P. O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

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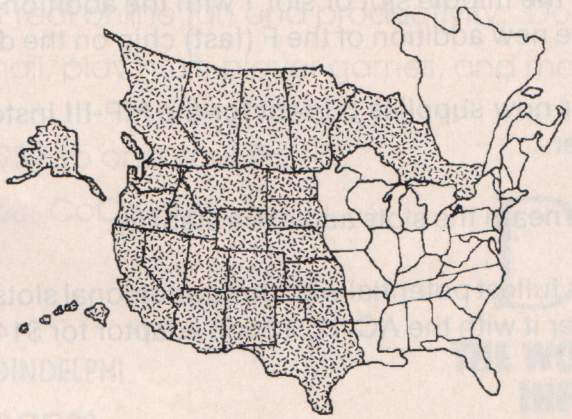

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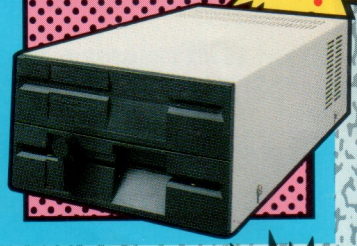

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